UNITED STATES ARMY OCTOBER 1967

AVIATION DIGEST

HAUNTING MISSION
PAGE 11

UNITED STATES ARMY AVIATION DIGEST

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The mission of the U. S. ARMY AVIATION DIGEST is to provide information of an operational or functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine, and other related data.

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LETTERS

Sir:

The TH-13T, in my opinion, is a fine daytime tactical instrument trainer. It costs little to operate when compared to other aircraft that are used for the same or similar purposes, and the training received is comparable to that received in larger and more expensive aircraft. I would, however, prefer to limit the training in the TH-13T to daylight hours with a minimum amount of time for a brief night orientation.

Each student who goes through tactical instrument training is required to fly approximately 50 hours on instruments—25 in the basic phase and 25 in the advanced phase. Before April 1967 each student was required to fly 5 hours and 15 minutes of those 50 hours at night, 1 hour in basic and 4 hours and 15 minutes in the advanced phase. The student now gets only 4 hours of night instruction in the course. The time in the advanced phase has been reduced to 3 hours.

The above being true, the advanced instrument instructor who had three students was required, before April 1967, to give 12 hours and 45 minutes of night instruction every 4 weeks. The present instructor with three students will average 9 hours per 4-week period. Twelve hours and 45 minutes or 9 hours per month per instructor pilot is a lot of night time, especially for instrument instruction under the hood.

The instructor pilot who flies the TH-13T for 12:45 or 09:00 flight hours at night per month has many causes for concern. He is faced with the normal problems associated with night flying plus many others. The following is a list of a few:

(1) A landing light that is not adjustable in flight.

(2) No standby or backup electrical power source.

(3) The restrictions of IFR flights.

(4) The density of aircraft entering, working around, and departing traffic at the tactical sites and the base heliport.

(5) The student.

How do these five problems present causes for concern? First, let us consider the landing light that is not adjustable in flight. The only way you can search or see with the landing light in flight is to aim or point the aircraft in the direction you desire to look. Then if the light was adjusted properly before takeoff, you see a little. If, however, it was not adjusted properly, it is best that you leave it off. Why, then, should the instructor pilot be concerned? What happens when the engine quits and he cannot see where he is going?

There always exist the possibility of complete electrical failure when no backup power source is available. In the event of complete electrical failure, the instructor pilot, with the aid of his flashlight, should be able to return to home base and land safely. His aircraft, however, cannot be seen by the many other instructors flying in the same general area, and he has no communication capability. Also, he does not have a written guarantee that the engine will not quit after the generator fails. If it does, what action does the instructor pilot take?

Instrument flight rules force the instructor pilot to allow his student to fly from point A to point B as cleared. His flight path, in many cases, will be over areas not suitable for forced landings. If the engine quits in the day, it would be very hard to make a safe landing in some of those areas. What would happen if the engine should quit over such an area at night?

The density of aircraft working around the heliport and the tactical sites is both a day and night hazard. The hazard, however, increases at night because of reduced visibility and the fact that several sites do not work at night. When one site is off the air more aircraft are forced into the area around the operational sites, thereby increasing the aircraft density at that site. And as the density goes up, the margin of safety goes down.

Finally, there is the student. In many cases the instructor pilot cannot predict what the student will do; consequently, he, the instructor pilot, is forced to give much attention to the gauges and the student pilot. Going in and out of the cockpit gets a little hairy when you are forced to work in reduced light in a limited area with many other aircraft.

As stated before, these causes for concern are only a few of many. I believe that most instructor pilots, pilots and student pilots will agree that the additional training received from hooded night flights does not equal the additional risk involved. The only difference, in my opinion, in hooded night flights from hooded day flights is a red instrument panel.

The reduction of advanced instrument night time for 4 hours and 15 minutes to 3 hours is a step in the right direction. When will we take another?

CPT JOSEPH E. TAYLOR, JR.
Advanced Instrument Flight Div
Dept of Fixed Wing Training
Ft Rucker, Ala. 36360

Sir:

There seems to be a problem in this area of interpreting AR 672-5-1, paragraph 108.4. This is in regard to the awarding of the Senior Aircraft Crewman Badge. Does this require seven (7) years of actual flight status, or does it require seven (7) years in aviation and during this time serving as a crewchief, crewmember, technical inspector, or maintenance supervisor and drawing flight pay at the time of the recommendation?

This affects many senior NCOs in this command and your assistance in interpreting this AR will be greatly appreciated.

SSG WILLIAM P. CAMPBELL
146th Aviation Company (RR)
APO San Francisco 96307

• *We referred your question to the Adjutant General Section, and CPT H. H. Ferguson, Jr., gave the following answer:*

"1. In order to qualify for the award of the Senior Aircraft Crewman Badge an individual requires seven years of actual 'flying status' in addition to meeting the other requirements of AR 672-5-1.

"2. The fact that an individual served 'in aviation' does not qualify him for the award. The key words are on 'flying status' and not 'in aviation.'

"3. Also, the fact that an individual is drawing flight pay at the time of the award has no bearing, e.g., an individual has served 'in aviation' for ten years as a technical inspector. The first nine years was not on flying status. The last year was on flying status. The individual is not qualified for the award until he completes seven years, not necessarily consecutive, on flying status."

A Hole In The Airmobile Concept?

Plug It With The Mohawk!

Lieutenant Colonel James C. Crawford

DURING THE battle of Ia Drang and again during the Bong Son campaign, it became apparent that a reconnaissance deficiency existed within the airmobile division. Although the 1st Air Cavalry Division has an organic OV-1 surveillance platoon of six Mohawks and a cavalry squadron consisting of three air cavalry troops and one ground troop, this deficiency has never been successfully overcome. As the pattern of airmobile operations evolved in Vietnam, there could be no doubt the airmobile division must always be prepared to survive in an area either partially or completely surrounded by enemy dominated territory.

The necessity to thoroughly screen the periphery of the area of operations was immediately recognized. Early efforts in initial combat phases to provide this reconnaissance screen from organic resources proved successful. This success can only be attributed to the small size of these areas of operation. The cavalry squadron was able to provide complete reconnaissance coverage and screening for these small areas. This reconnaissance provided the battalion or brigade commander an up-to-the-minute report of enemy movement and sightings.

As the campaign of western Pleiku province unfolded in October 1965, the tempo of operations rose to maximum intensity culminating with the Ia Drang battle in November. In this battle all available division combat power was committed. Intelligence placed nearby three North Vietnamese regiments and a divisional size control headquarters with the capability for a coordinated attack. The area of interest at this time had grown far beyond the screening capability of the air cavalry squadron. The threat posed demanded that a maximum effort be expended to immediately detect all enemy movement as well as troop locations. The division reconnaissance scope was changed to incorporate Air Force infrared surveillance with the regular organic Mohawk IR and SLAR night coverage.

Some training and familiarization of the electronics surveillance qualified aviators were necessary initially to acquaint them with visual reconnaissance techniques from the Mohawk. All assigned aviators were extremely well qualified in the aircraft and in tactical low-level navigation. They undertook the VR program with enthusiasm, exhibiting a high degree of airmanship and courage. The area to be covered was outlined by the division G-2 and published in division operations orders. Mohawk aviators were briefed by G-2 personnel on locations of special interest, flight paths and altitudes to be observed, communications procedures to be followed, and the general friendly and enemy situation.

Even though only one aircraft could be committed on a part-time basis, immediate results were obtained. The movement of noncombatants, indicating possible Viet Cong activity, was detected immediately. Highly suspect areas were plotted for division-wide dissemination and action. Enemy troop sightings were immediately reported.

This limited VR program provided the following additional benefits: restricted enemy movement to areas of heavy cover and difficult terrain thereby impeding reinforcement, resupply, and regroupment. Further, it provided the division G-2 with the ability to immediately verify reported sightings.

This first semblance of reconnaissance security around the perimeter of the current area of interest proved complementary to other information gathering mediums. Although this basic program has been repeated for many campaigns and operations by the 1st Cavalry Division, it is, at best, a stopgap measure which can be described as a "rob Peter to pay Paul" scheme. Nowhere within the division are there provided the necessary resources to accomplish this vital combat support mission for the airmobile division.

Use of electronics surveillance equipped Mohawks in a visual role can be justified only as a stopgap measure, but the con-

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tinuation of this practice with these expensive, specialized aircraft can hardly be adopted as routine. Although there are serious objections to the employment of OV-1s in the visual role because of exposure to small arms fire at the low altitudes associated with VR, the primary objection stems from the diversion of these aircraft from their designed mission with the subsequent deletion of needed electronics information from countrywide intelligence.

Armed OV-1s of the Mohawk battalion, which was organic to the 1st Cavalry Division's forerunner, the 11th Air Assault Division, provided this vital service. This Mohawk battalion was dropped, however, when the 1st Cavalry Division was reorganized as the Army's first airmobile division. Unfortunately, no provision was made for resources for a reconnaissance screen of the huge areas that can become of interest to the airmobile concept in a combat environment such as Vietnam.

The cavalry squadron provides exceptional reconnaissance for the division around battalion and brigade areas. It can do little, however, to seal off the overall battle area, even during critical battle phases. What is needed is a complement to the cavalry squadron which can extend the screen and range far beyond the squadron's practical limits. An armed aircraft with a cruise speed between 175-225 knots, a three hour on station time, the capability of slow flight, good visibility, toughness, and a sound, versatile communications capability is required for this mission.

Today the Mohawk is the only Army aircraft which can accomplish this mission with the desired results. The new family of armed helicopters with longer range, increased speed, and lower maintenance demands may very well fill this need. Regardless of the vehicle designated, responsibility for performance of this reconnaissance mission must be clearly defined, and the necessary hardware and resources must be made available. Without this capability the division will suffer from a lack of immediate hard information or rely heavily upon outside intelligence which is seldom timely or accurate.

This apparent oversight and reconnaissance deficiency should be eliminated immediately. If the airmobile concept is to improve and exemplify the boldness imagined when it was conceived, there can be no better tonic than providing the division commander the long-range vision of medium performance aircraft.

PITCH, POWER AND EXPERIENCE

Perhaps the most direct cause of the accident was that a more adequate power check had not been performed

CW2 Christopher B. Chrobak

THERE WE WERE at 100 feet, airspeed 20 knots, rpm 6000 and falling like a rock. The aircraft commander, flying our UH-1B from the left seat, flared the aircraft to stop our forward movement as we approached the opposite bank of the canal. Then to improve our condition, or should I say deteriorate our predicament, the tail rotor struck the only piling in the canal for miles around. Immediately the aircraft yawed right approximately 30-40° before striking the ground and resultant roll-over and total destruction of one aircraft.

Now let us back up a little in this tale of woe. Our flight of six aircraft had taken off from point A after refueling. We were en route to point B, about a 10-minute flight at 80 knots. We landed in a trail formation on a narrow road of sorts. As soon as we landed the junk was pouring on the aircraft—in boxes, baskets, and buckets along with six of the little troopers and their 81 mm mortar.

Then came our test of airworthiness or flyability you might say. We failed that test miserably. Off the ground we staggered, but not to an altitude of more than 6 inches and not for more than 10 seconds. Down to the ground we settled, and in spite of his protests off went one of the little troopers. We clawed our way into the air to 2 feet altitude with a loss of only 200 rpm; 6400 at this time, no sweat. But the perspiration did begin as we shuddered into effective translational lift at 4 feet, 6100 rpm as we crossed over a double apron of barbed wire enclosing a mine field.

The flight settled down in a V, heavy right of four aircraft, the remaining two being used to sling-load drums of gasoline. Twenty minutes later as we neared our destination, point C, the anti-collision light came on from the lead ship, and we edged left to become the last ship of the now trail formation. The platoon leader was at the front of the formation, his status being not that of a FNG (friendly new guy) but his experience not that of an old-timer either; so we began at 70 knots and steep at 1,000 fpm for our formation and loading condition.

Our descent was made from 2,500 feet MSL on a left base to the aircraft's final resting place—a soccer field immediately east of what was once a province chief's house. On short final we fell slightly below the preceding aircraft, never to rise again. The rpm was bled off to 6000, necessitating a gradual decrease of power and resultant regain of 6600 rpm, then back to 6000 to get all we could to attempt to at least slow up our descent. From this point on you can rely on your memory, or if it is as short as mine you may reread the first paragraph.

Now to present some excuses:

• The aircraft commander and I were right out of flight school and had no experience. This is, of course, a factor but not entirely true since he had four months in-country and myself three, having both accumulated approximately 100 hours per month flying exactly this type of mission.

• Light a fire and kick a tire. Overzealousness to complete the mission; could also be looked at in the light of laziness. Why do in three lifts what you can maybe do in two. If not deterred by better planning and just common sense, this can almost always develop into a serious if not sometimes fatal mistake.

• We should have made a more shallow approach and in a different formation. Maybe the approach could have been a little more shallow and in a different formation. This is to say that

CW2 Chrobak is now serving in Vietnam.

The perspiration began as we shuddered into effective translation lift

maybe the bullets would bounce off, and in landing a V formation to the almost adequate field that we may not have had the thrill of roosting on one of the surrounding buildings.

Now to view some other choices to the action taken:

• Refueling at point A could have been to a minimum amount to complete only one round trip, i.e., A to B to C to A.

• Instead of having boxes, baskets, and buckets of junk, it should have been boxes, baskets and buckets of junk of known weight. This, of course, would be nice, but not very easily accomplished, or for that matter practical under the conditions.

Now to the heart of the problem and probably the most direct cause of the resulting accident:

• A more adequate power check could have been performed. Use of the go-no-go power check which since evolved would have, I am certain, informed us that we were hunting for a place to crash and it just depended upon where we chose to land. I say "which has since evolved" because our aircraft were not placarded as they all are now, or at least should be, with N_2 information. In addition, I had never heard of this technique. It just amounted to my premonition that if you could hover you could get flying and accomplish a landing under the same approximate altitude and temperature conditions. Perhaps our overzealousness let rotorwash in a formation landing and other important considerations slip to the rear of our minds.

So, I say in closing that you determine the type takeoff and landing that is required, be it running, normal or maximum performance, and then let your N_2 percent rpm decide whether you have your 1 percent, 2 percent, or 3 percent, respectively, to go or no-go.

Too often there is a reluctance to mention parachutes in the same breath with helicopters. In some circles this quickly makes you the Happy Hour candidate for a section eight. But let's investigate it.

A Chance To Live

CW2 James L. Irwin

YOU SLOUCH dejectedly on the skid of your aircraft and glare sullenly at the slowly tumbling grey mass of monsoon weather above. Your original impatience with the weather has gradually degenerated during the morning to complete indifference. Four hours! Seems like four days, but a glance at your watch confirms your original estimate.

You move a little and your right leg feels different somehow. Ha, the only smart part of you has gone to sleep. With a struggle you stand up, wobble a little, and then stretch. A glance at the load on the cargo floor confirms that it is secure. Twenty-eight rounds of 105 mm ammo: quite a load for the takeoff area available and the density altitude. A slight smile crosses your face because you know you can handle it. Secretly you're sure you can handle almost anything.

These rather pleasant thoughts are broken by the unmistakable whup whup of an approaching Huey. One of the gunships is returning from a weather recon in the valley to see if there is a 1,500 foot ceiling yet. The valley is bad news, but with 1,500 feet we should be OK.

Twenty minutes later: 1,500 feet above the valley entrance. You're the lead element of two, winging your badly needed cargo to a small Special Forces camp.

You've picked 70 knots as the most tolerable vibration level for this altitude, 4,100 feet MSL — an altitude that just clears the clouds. You settle down now for the 12 minute trip up the valley. The crew has been briefed and knows your rules of engagement for defensive firing.

You look at the mountains rising almost to your height on each side of the valley. Not so majestic as the Sierras, but picturesque and beautiful in their own way. So very quiet and serene everything appears from up here. Like the jungle below, so lush and rich with its many shades of green. But, oh how deceiving. You know the area is teeming with VC. Probably a thousand eyes on your ship right now.

What's that?

Aroused, startled, you look at your copilot. You start to ask if he heard a shot, but before you can you know the answer. You're acutely aware now. Only a fraction of a second has passed. You start to radio the gunships, you squeeze the trigger switch hard — then — CRACK — THUD.

"My God!" Looks like a solid wall of tracers. The gunner and crewchief have opened up. So much noise — CRACK — THUD. You sense, rather than feel, the ship taking hits. The clouds — must get some cover — POW — CRACK — here come the clouds — copilot's checking the gauges — the cloud — finally — we're in it — thank God for clouds — must get on instruments. The crewchief stops firing as the ground slowly disappears. In the background now you hear the gunships working.

FIRE! You see the glow in the cloud just as the crewchief yells frantically into the intercom. Gotta think — must descend — you steal a quick look to the left cargo door — it's just behind the door — must be the fuel cell. The radio crackles; it's your wing man reporting that you are on fire. You acknowledge as you lower the pitch. You begin to see the ground. There you're out now. The radio again — the gunship tells you the fire is intense. Autorotate, road to the left. Yeah, there it is, pitch all the way down. We can just make it. Close now, only a few hundred feet to go. A little aft cyclic as the nose slowly drops. Strange, you think quickly. There it goes again, slowly — more aft cyclic — just crossed the river — more aft cyclic. Wait — there isn't any. What's happening?

A 105 round rolls down to the pedestal; there's another one. The nose is lower now and beginning to accelerate. Somebody screams —a blood-curdling thing, deep and guttural, changing quickly to a tearing, lacerating gargle. The nose is past vertical now. The lush green slides crazily by; the 105 rounds are falling all around you. Your body strains against the seat belt; you know it's all over with — 30 years. *Nothing* you can do. You wait. You feel the heat — then nothing.

Although the details are supposition, the incident just described actually happened. "A tragedy, but that's war," you say. "I'll get it when my number is up." "The law of averages."

CW2 Irwin is assigned to the Flight Standardization Division, Dept of Rotary Wing Training, Ft Rucker, Ala.

A Chance To Live

We've all heard these comments before. They head a list that has been called "The Seven Deadly Beliefs." Deadly? Yes. With this attitude, even if we could roll back the clock, the tragedy of this flight would occur again, because we would not have acted to change any of its ingredients.

Assuming that the surprise attack could not have been avoided, what then would we change? Let's review the situation. The aircraft caught fire as a result of hostile ground fire causing leakage from the fuel cell. The aircraft had an external fire adjacent to the left fuel cell. It was intense, but did not visibly spread. The aircraft was 1,500 feet above the ground and the pilot executed the only emergency procedure available: he entered autorotation. About 45-50 seconds later, while still several hundred feet from the ground, the aircraft suffered catastrophic structural failure as a result of being weakened by fire. The fire had still not visibly spread. In this case the supporting structure for the tail boom attachment had failed.

What to change? Well, our hindsight being what it is, we see that in all probability the aircraft could not have descended intact from 1,000-1,500 feet regardless of the technique used. Therefore, one obvious solution would have been for the crew to separate from the aircraft. By now you might have sensed a reluctance to mention *parachutes* in the same breath with helicopters. In some circles this quickly makes you the Happy Hour candidate for a section eight. But let's investigate.

In anticipating some of the opposition's arguments we find they usually go something like this: "Be impossible to escape from anyway, with the rotor and all" or "Operate too low — wouldn't open anyway" or "What about the passengers?" and on and on.

Let's examine some of these in a little more detail.

The following are summaries of successful escapes from helicopters obtained from the files at U. S. Army Board for Aviation Accident Research:

HOS-1 — Pilot and mechanic bailed out after rotor head left aircraft.

HUP-2 — Pilot left aircraft after nose pitched down to vertical. Engineer waited until too late and was killed.

H-43B — Pilot bailed out after rotor blades separated from aircraft at 4,500 feet absolute.

UNK — Pilot bailed out after rotors left aircraft at 2,500 feet absolute.

H-21C — Rotor blade struck aircraft. Aircraft broke apart. Pilot bailed out.

OH-5 — Aircraft at 6,000 feet absolute. Rotor blade sliced through cockpit. Aircraft disintegrated. Pilot and copilot made successful parachute descents. Copilot bled to death on ground from massive injury sustained when blade cut through cockpit.

CH-47 — Aircraft became uncontrollable after violent evasive maneuver to avoid collision at 2,000 feet absolute. Aircraft was inverted during oscillation. Pilot bailed out. Copilot bailed out when nose was down 90°. Both were successful.

HRS-1 — Engine failed. Cooling fan jammed cyclic control. Engineer bailed out successfully while aircraft was in autorotation. No separation problems were encountered. Pilot regained use of cyclic and continued autorotation successfully.

The list is still relatively short and is populated for the most part by aircraft of the other services, but it would have been considerably shorter if parachutes had not been on board. The most traditional arguments against using parachutes in helicopters are based on the helicopter's unique capability to autorotate. The successes listed above occurred after autorotation was no longer possible. These instances conclusively illustrate that successful emergency escape is possible under even the most adverse circumstances. The OH-5 incident illustrates that the crew may survive even after the cabin has been struck by a main blade.

Rare occurrences? Sure they are. But how many control or related malfunctions have occurred that might, through circumstances have resulted in loss of control? From the USABAAR Weekly Summary for the weeks 3 Jan - 21 Aug 66 for one type aircraft, the UH-1, we find —

Transmission failure	1
Transmission oil leaks	10
Cracked mixing lever	2
Flight control malfunction or hydraulic loss	30
Inflight fire	5
Tail rotor loss (left aircraft)	2
Tail rotor failure	24
Main rotor blade failure	1

And so on for a total of 109 incidents of this type.

Many of these malfunctions can be tolerated while flying within 1,000 feet of the ground in VFR weather. The aircraft could probably be descended to a landing in 30 to 60 seconds. The same malfunction at 3,000 to 10,000 feet above the ground presents different problems. Several minutes may be required to descend, even in full autorotation. The aircraft simply may not remain flyable long enough to reach the ground under control.

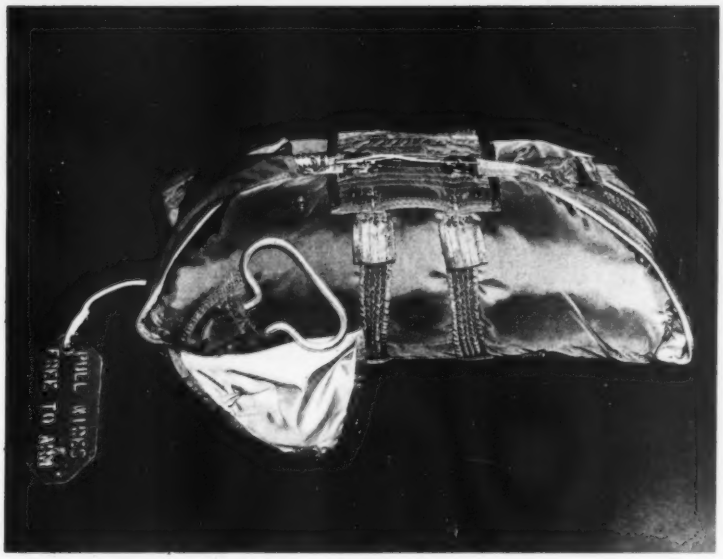
Even a simple engine failure can take on monumental significance if the weather and terrain are of the wrong type. Aviators who have flown the highlands of Vietnam will recall, I'm sure, a

number of hours spent near 10,000 feet, probably on top. Ponder for a moment your actions while cruising "on top" of a solid undercast over mountains covered with 150-foot mahogany trees if your engine quits. During the same period noted above 104 power failures occurred in UH-1 aircraft.

The Army currently has two emergency type parachutes in its inventory that could be used for helicopter crewmembers and passengers. The first, the 28-foot back type parachute, is used in fixed wing Army aircraft. It has a 28-foot nylon canopy and is ripcord deployed. It weighs approximately 26 pounds complete. According to TM 57-220 it will fully deploy in an average of approximately 5 seconds at 60 knots. As the airspeed increases the deployment time decreases. At 60 knots of airspeed approximately 275 to 300 feet of altitude would be required for full deployment.

This parachute could be worn by all crewchiefs and door gunners. It does not restrict their movements; nor is it unduly uncomfortable over long periods of time. In UH-1 aircraft with removable seat cushions it can also be worn by the aviators, and in fact fits very nicely in place of the seat back cushion. As in the case of the gunners, it does not restrict pilot action. Tests have shown that it can be put on by one person unassisted in an average of 20-25 seconds; by using the buddy system it can be put on in 11 to 15 seconds.

Tests were also conducted to determine the time required for the crew to leave the aircraft. The tests were conducted in a UH-1B gunship (M-16) in full Vietnam trim. Timing was started in simulated cruise flight configuration by the command "Bail out!" For the right pilot seat this sequence was used: jettison door, release seat belts and harness, pull helmet cord, leave aircraft through right door opening. Total elapsed time averaged *10 seconds!*



The Army is testing a ballistics deployed reserve parachute (above)

From the left seat, the sequence was essentially the same. However, it was found to be faster to pivot across the pedestal and exit from the right cargo door. This was necessary due to restrictions imposed by the sight, collective lever, and armor plating. The overall elapsed time from the left seat was *12 seconds!*

Crewchief and door gunner could consistently depart the aircraft in *1 - 3 seconds!* With a little practice, and the added impetus of an actual emergency situation, these times could probably be improved upon.

The later UH-1s with webbed seats are not suitable for the back pack type parachute without relocating the seat tracks. However, the 28-foot chest type parachute, the other parachute available to Army aviators, could be used as is. This parachute has approximately the same opening rate or deployment time and weighs only 14 pounds. It could be used by passengers very easily with little or no inconvenience. At the aircraft, the crewchief and gunner would hand every passenger a simple harness. After the passenger entered the aircraft the parachute could either be clipped on or kept handy.

For the combat assault they would not be practicable and would not be used. The chest type parachute can also be worn by the pilots and although it requires a different combination of seat/pedal adjustment it is not in the way.

Of interest also, the nylon chest pack is virtually bulletproof up to .30 caliber size weapon, and its uses in the survival situation appear to be limited only by the user's imagination.

The Army (USAAVCOM, St. Louis) is currently nearing completion of tests on a new troop reserve type parachute that would suit our operations very well. It is known as the ballistics deployed reserve. It has generally the same overall dimensions and weight as the existing reserve; however, for the helicopter crew-

A Chance To Live

man it offers significant advantages. It will fully deploy in .9 to 1.3 seconds. This means one could safely jump from a hovering helicopter at 175 feet or with a minimum of forward speed from as low as 150 feet! The 24-foot canopy is ejected from its pack at a 30° angle by an explosive charge. Because of the angled ejection, it can be deployed from any body position. A parachute with these characteristics would make even *very* low level escape possible, when used with a suitable harness of the QAC (quick adjustment capability) type.

It is conceivable that Army rotary wing aviators who have flown for years without a parachute might hesitate to resort to its use until too late. For this reason, simply strapping a parachute on an aviator's back in itself will not totally satisfy our quest for increased safety and longevity. Along with issuing the parachute must come instructions on its use and training in recognizing the situation that demands its use.

One possible way to accomplish the formulation of a use plan would be a seminar held by the aviation unit. The seminar would be comprised of aviators who have returned from Vietnam who could, through recall of their past experiences and observations, develop a plan that could be used as a cockpit guideline. This could also be accomplished by a committee or possibly during a monthly safety meeting. The point is, some thought must be spent on the subject before the emergency to aid the aviator in making his decision.

In the recent past, the helicopter has enjoyed a new and monumental acceptance, that of the combat machine. With its new duties and responsibilities have come new risks — risks that have been accepted by aircrews without question. As a result of the hazards involved in operating in this new and hostile environment, our losses have understandably increased. When investigating some of the losses it becomes quickly apparent that the autorotation will not cure all helicopter ailments. This being the case, the aircrew should have the option of bailing out. There have been a number of instances when, with proper indoctrination and parachutes, the entire crew might have escaped an otherwise certain death. In other instances it would have been possible only for the crewchief and/or gunner to escape.

In conclusion there remains one fundamental question: How many lives do you have to save to make a safety device worthwhile?

Professionalism and You

WO1 David Talbot

PROFESSIONALISM — can this term be applied to us as aviators and aviation personnel? Let's take a closer look at the word defined by Mr. Webster: "Professionalism is the standing practice or methods of a professional as distinguished from an amateur."

It is easy to comprehend how this self-attained attribute can be closely integrated within our zero defects program. If we exercise this sense of professionalism consistently in our daily routine, we will be capable of maintaining zero defects within our individual zones of responsibility.

How does this sense of professionalism affect us? We all know that the mission is of utmost importance and that safety plays a major role in accomplishing that mission.

The term "safety" is thus equally important in our role as aviators. For if we fail to perform as professionals, how are we going to ensure disciplined safety measures? It is simple to see that by combining mission and safety we can attain the desired results. Therefore the only way we can attain professionalism is to think and act the part. Professionalism must remain our never ending goal.

It then becomes our duty as professionals to use our experience and training in the most efficient way possible to accomplish the mission. We cannot afford to take a negative attitude; our decisions and performance affect the lives of many.

We should continually try to instill upon ourselves a sense of pride and professionalism. No matter how minute the job, we should constantly strive for perfection. By adding this attribute of professionalism to our list of capabilities, it will become the ingredient that will give us the net result of a worthwhile safety and zero defects program.

I have given the problem considerable thought and I think I have come up with a haunting program that will work. It's one that will terrorize the human who flies the machine and cause no end of confusion

THE DATE WAS December 18, 1903. The time was 2000 hours.

Top ghosts of the Haunters, the military arm of the Kingdom of Disembodied Spirits, were in their red plush seats in the conference room at Haunter's Barracks, Shadow Island. The conference had been hurriedly called by the Chief Specter. Some of the ghosts present had flown all day to make the meeting and looked tired from the lack of a good day's sleep.

Suddenly the senior ghost among the group called, "Attention!"

Conversation stopped instantly and all present stood up. The Chief Specter came into the room at a brisk walk, his long white robe flowing behind him. He was followed closely by his chief aid, who was carrying a load of papers.

"At ease," the Chief Specter said.

"Ghostmen of the Kingdom, we are confronted with an emergency. Yesterday, something happened that I'm afraid passed unnoticed by most ghosts and humans throughout the world. Two human brothers by the name of Wright flew a power-driven heavier-than-air flying machine, which they had built.

"Now this machine is crude and the flight was for only a few seconds. But my soothsayer ran it through his crystal ball computer and doublechecked it on both his tea leaf and playing card computers. He found that this flight is only the beginning. Soon humans will be flying in their machines almost as well and as fast as we can.

"This presents a serious problem. If my soothsayer is right, and I feel reasonably sure he is, we will soon be faced with the job of haunting these machines as they move along at many hundred miles an hour.

"Since the flight yesterday, I have given the problem considerable thought and I think I have come up with a haunting program that will work. It's one that will terrorize the human who flies the machine and cause no end of confusion.

"Unfortunately, our recruiting drive has not produced the number of ghosts we need; so we don't have the ghost power to organize

When he tries to correct the problem, he will go back into the original spin

a separate ghosting division to handle these new machines. Instead, I will assign each of you a separate mission that I hope you can handle right along with your regular duties."

He turned to the ghost occupying the first seat to his right and said, "Unearthly, I want your Ogre Division to be in charge of what I call autokinesis. If you work it right, it will be a most effective weapon. Since humans have eyes inferior to ours, they have trouble seeing at night. They must use lights. So, when they start flying, they will have lights in their cockpits and on the ground to tell them where to land or take off.

"Your division will make these lights appear to move when a human stares at them for say 10 to 20 seconds. For the present, anyway, flying machines invented by the humans will have to use runways. As the human starts his machine down the runway and fixes his gaze on the runway lights, they will appear to move outward or diverge. The human, of course, will attempt to compensate for this movement, and before he gets off the ground he will be off the runway with disastrous results."

In his enthusiasm, Unearthly forgot that the Chief Specter was talking and broke in to say, "After I get through with those humans I'll bet they'll never try to fly again!"

"Let's not forget," the Specter said, "no weapon is perfect. For every new weapon developed, someone develops a defense. The humans may soon learn not to stare at the lights. And in all probability they'll learn that when they must stare at the lights, they need simply to shift their eyes away periodically. That will nullify our light moving technique."

Turning to the ghost next in line, the Chief Specter said, "Uncanny, here is the assignment for your Vulture Division. I want you to operate the false horizons. When one of these humans is flying with no reference to the actual horizon, his inferior coordination between eyes and brain will make him believe that the cloud banks he sees are horizontal. The impression he will receive will be so strong that it will force him to change the attitude of his flying machine. I want your Vultures to see to it that few, if any, cloud banks are horizontal.

"Of course we can expect that a few of them will wise up and pay attention to the false horizons created by cloud banks. However, if they eventually invent an instrument that will keep their flying machines horizontal, we can be sure that not all of them will have the good sense to use it.

"Ghoul, how are you coming with your disciplinary problems in the Franjenstein Division? Are you managing to keep those drunkards out of the graveyards?"

"Making progress, sir. But they are still a hard drinking lot."

"Well, here's an assignment

they may like. I want your division to handle graveyard spins. Once in a while one of those humans will make a high speed roll or spin or a steep bank turn. When this rotary motion is stopped, I want your division to be right there, ready to slap him with the sensation of rotating in the opposite direction. He will, of course, try to correct for it and that will cause him to go back into the original spin again.

"Unfortunately, this effect will be greatly reduced if the human flier will have a good visual reference when he recovers from the spin. But his best defense against our haunting weapon will be to avoid spinning. Let's just hope he doesn't find that out."

Turning to the other side of the conference table the Chief Specter said, "Supernatural, I want your Phantom Division to handle leans. The humans can be expected to develop all kinds of instruments to help them in their flying. Eventually, no doubt, they will be able to fly almost completely by instruments. I want you to fix it so that during instrument flying if the human does not focus his attention on the instruments, and if the flying machine should roll suddenly to the left and then recover very slowly, the human will feel that the machine is still banked to the left. Of course, the flying machine will actually be straight and level.

"Banshee, I want your Hallucination Division to handle the reversal of figure and background. Your division will make the indicator on an instrument sometimes appear to be stationary and the dial to move. I am hoping this will make the human flying the machine think the instrument is moving rather than his machine.

"Now that's as far as I've gotten in my haunting plan. I have in mind to do something with illusions. There are so many fantastic things we can do with illusions that I want time to sort them all out before they are introduced in the program. For instance, we can make areas of ground fog be mistaken for lakes and ponds, distant clouds over water and cloud shadows appear to be islands, and low lying clouds appear to be hills and mountains. We can even make cracks, scratches and dirt on canopies appear to be distant objects. Can you imagine the hilarious confusion when one of those humans tries to fly out of the path of a spot on his windshield?"

There was an outburst of diabolical laughter.

"Are there any questions?

"No? Well then, you may return to your posts of haunting. As soon as I have made up my mind on illusions I will send them to you by the usual thought wave."

AVCOM procurements hit new high

PROCUREMENTS by the U. S. Army Aviation Materiel Command have established an all-time record for the fiscal year ending last June 30, largely in response to urgent requirements stemming from the war in Vietnam.

Totaling $1,361,500,000, they mark the second straight year that AVCOM's purchases of end item aircraft, repair and replenishment spare parts, maintenance and support equipment, aerial delivery items, engineering and other services have exceeded the billion-dollar mark. The total for the year now ended compares with procurements amounting to $1,227,432,000 during the previous fiscal year.

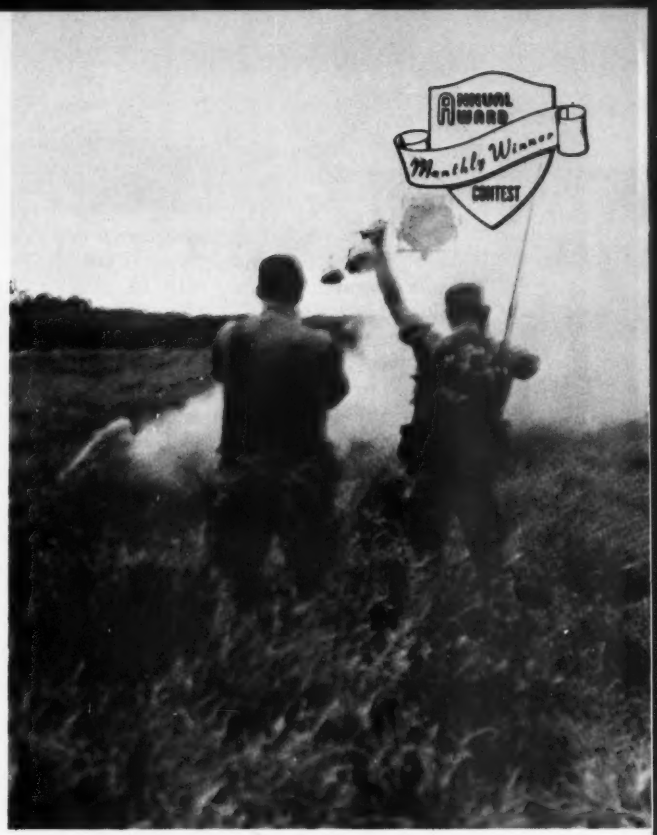
Ranking topmost in procurements during FY 67 were $206.5 million in contracts awarded to the Bell Helicopter Company of Fort Worth, Texas, for production of the UH-1 Huey and of the newer AH-1G HueyCobra rotary wing gunship.

Other large procurements of end item aircraft during the same period included the following:

CH-47 Chinook helicopter (Boeing-Vertol), $135.6 million; OV-1 Mohawk fixed wing reconnaissance aircraft (Grumman), $43.2 million; CH-54A Flying Crane heavy lift helicopter (Sikorsky), $38 million; OH-6A Cayuse light observation helicopter (Aircraft Division, Hughes Tool Co.), $28.2 million; U-21A utility fixed wing aircraft (Beech), $23.5 million; U-8 Seminole utility fixed wing aircraft (Beech), $6.8 million; T-41B fixed wing trainer (Cessna), $3.9 million; O-1 Bird Dog fixed wing observation aircraft (Cessna), $2.8 million; and the TH-55A primary helicopter trainer (Aircraft Division, Hughes Tool Co.), $1.4 million.

Also soaring to unprecedented heights were AVCOM's procurements of aeronautical spare parts. Totaling $643,021,672 for the year just ended, these procurements compared with $525,991,838 in FY 66 and $125,098,838 in FY 65.

If you know how to use it, it can save your life. If you don't it can kill you



The Smoke Grenade...

A Couple of Ounces of Prevention

Captain James J. Dorsey

CEASE FIRE! . . . Cease fire, Firebird!" The pair of rockets exploded. As the smoke rose, the voice of the Special Forces adviser below, weak with relief, came over the FM. "You almost got me that time, old buddy."

"Sorry about that," I said to myself, "but that's what you get, old buddy, for not carrying any smoke grenades."

Sounds kind of callous, doesn't it? But it was only about the hundredth time I'd run into the same problem. It's a typical one, and if you haven't run into it yet, you are going to. You are going to scramble to cover some ground unit in heavy contact, and when you get to the area, you are going to find out that they have no way to mark their position. And then you are going to waste time and ammunition (while the man on the ground wastes lives and blood) trying to figure out where the good guys are. If you are flying a "slick," you are going to have to expose your aircraft at low altitude while you fool around looking for the friendly position. If you are flying an armed ship, you are likely to risk the lives of the people you are trying to help by marking with your own ordnance.

Solution to the problem is simple. It's so simple a lot of people never really appreciate it. The solution is knowing what the plain old humble smoke grenade, M18 or A/N M8, can do for you. (And what it can't do.) If you

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know how to use it, it can save your life. If you don't it can kill you. There are a lot of lessons you can learn the hard way, if you want to. But you're going to spend a lot of that time, ammunition, and blood we were talking about while you're learning.

The first thing you are going to learn is that there is a reason the guy on the ground doesn't have any smoke grenades with him. It's not because he is worried that the enemy will capture them. "Charlie" already has plenty of smoke grenades. It's not because the ground soldier doesn't want to carry the extra weight around, either. WIAs weigh a lot more than smoke grenades, and the soldier who won't carry smoke grenades will carry his wounded willingly, even when he gets more of them because he can't mark for a strike or medevac. Most of the time, it's not even because he has run out of them. He doesn't have them because he didn't have them to start with. What's more, he doesn't see any reason for carrying them.

It's not his fault. He thinks that you can see him, because he can see you. When he steps out of the jungle into a clearing, he only sees one clearing. You may see 30 clearings, but he only sees one. He calls it "the" clearing. The road he is on is "the" road. The enemy fire may be coming from "the" treeline. When you ask him which one, he may tell you it is the one in front of him. He doesn't realize that you see many treelines, many roads, many clearings. The world he is fighting in looks small to you, but it looks big to him, and he is getting shot at while you hunt for him. He doesn't have time to solve your problems. He needs help, he needs it now and fast, and he doesn't see what good a smoke grenade is going to do.

Don't think it is a simple matter

An error that cost 60 lives!

of education. The problem is much more fundamental than many aviators realize. For example, during one operation, a Special Forces sergeant kept telling an armed helicopter fire team that he was "right underneath" them, "in the clearing." He had to wait, under heavy fire, until the fire team had located him. When the fire team found him, it was a simple matter to neutralize the enemy positions, while the adviser kept yelling, "I'm glad you guys are on our side!"

There was nothing new or green about that soldier. He'd been in the area for a long time, he knew he was going to have armed helicopter support on the patrol, and he knew he was going to contact the enemy. After the operations, he was told he'd made a serious mistake by not carrying any smoke grenades with him. He laughed. Brave? There are some other words for it. He sure wasn't laughing when he was pinned down.

You may not be able to explain your problem to the ground soldier. You must understand his. Be prepared. Whenever possible, make sure the ground troops have smoke grenades; and if marking procedures aren't covered by SOP, work some out on the spot.

You may have a chance to talk to the supported unit commander on the ground before the operation. Look him over. If you don't see any grenades hanging on him, ask him about it. He may have a real supply problem, or he may simply not realize that he is going to need to mark his position for you. Whatever the reason, don't wait for "next time." Get some grenades out of the aircraft and give them to him. You don't have to buy the grenades out of your own pocket; spread them around. The taxpayer didn't buy them so you could have a pretty display in the back of your aircraft. He bought them so you could help the people you are supporting. Grenades may be scarce, and your boss might have chewed you out for not having a prescribed number and type of grenades in the ship. Still, you can't stop the bleeding by telling the ground unit how hard it is to get them.

After you give him the grenades, you can work out some pretty effective preplanned signals. If you are covering a truck convoy, for example, a smoke grenade can tell you immediately when the convoy comes under fire. The smoke can show you which side of the road the fire is coming from, and which vehicles are being hit. You get needed information in a fraction of the time it takes for a radio transmission.

But a smoke grenade is not a substitute for a radio. It must be used *with*, not instead of, radio communications. Although preplanned grenade signals are useful, they break down when things start happening on the ground. You can't talk to a smoke grenade. No puff of smoke can tell you when enemy fires cease and shift, or what the supported unit is going to do next. You can't ask it how far behind the leading friendly elements it went off. And when night comes, it will tell you nothing at all.

The man who throws the smoke grenade must face the hardest fact of all: when he marks his position for you, he marks it for the enemy, as well. There are times when he cannot mark his position without loss. Take away his radio, and you

take away whatever aerial cover he has.

In a tragic example of what can go wrong, an armed helicopter fire team scrambled to cover a Vietnamese company with American advisers. On the way to the area, the fire team contacted the company's base camp and found out that the troops were in heavy combat. Their exact location was unknown. They had red smoke grenades, but no radio. They had instructions to throw the grenades when they heard the fire team. The fire team found them, but too late. The smoke was never thrown, and 60 men were killed and their weapons taken by the Viet Cong.

During the entire operation, the fire team was within easy range of a PRC-10. No one knows why they didn't throw the grenades, but a handful of aviators know this: all of those soldiers, and one of their American advisers, are dead today because someone thought they didn't need a radio as long as they had smoke.

During that operation, the enemy showed that he had some smoke grenades. He usually does. He has radios, too—just like yours. In fact, they used to be your radios and your grenades. He speaks English, too, so well that it can make the hair stand up on the back of your neck. If the ground unit you are supporting announces the color before throwing the grenade, you will often see two puffs of smoke coming up through the trees. If you land at the wrong one, you lose. Shoot at the wrong one, and you lose again.

There are ways to beat Charlie at his "guess-who" game. They all depend on coordination with the ground unit. One method is to have the ground unit call the color by referring to something Americans associate with a certain color. Faith, and you wouldn't

Hueys pinpoint troops in smoke marked area

expect the shamrocks to be *red,* would you now? Far out, but it has worked. Another, most often used, is to wait until the smoke is out before calling the color.

Sometimes this method won't work. The enemy may see the smoke as quickly as you do, or it may take its time drifting up through heavy trees. The puff is pretty thin by the time it gets above the jungle canopy, and the aviator may not see the wisp until Charlie's smoke comes drifting through. The best cure of all is a well-understood SOP. In one instance, Charlie made the sad mistake of throwing a color we planned to use to mark enemy positions. Couldn't have marked him better if we'd done it ourselves. Poor Charlie.

Remember, though, that the enemy is not the only one who sometimes gets his colors mixed up. Every now and then the people you are covering will get them mixed up. This is especially true of units with American advisers. The soldier who talks on the radio and the man who throws the grenade speak two different languages. The soldier you are talking to tells the other one to throw a certain color, and tells you what it is. But he is misunderstood, or the soldier throwing the grenade just doesn't have the color called for, and so you see a different color come up. This can happen whenever two people are involved. An urgent situation on the ground just increases the odds that it will happen. Be careful. It's always better to wait for him to say, "Sorry, wrong color" than it is for you to have to say, "Sorry, wrong target."

The wrong target may be struck because of another mistake. It is rare but very dangerous. When you ask an inexperienced soldier, or one who is caught in a really bad spot, to mark his position, he may do just that. He marks his own position, not that of his leading elements. In open country or paddy, he may be 200 meters behind the leading troops. Find out where his lead elements are before you shoot. Look out for this one whenever you get a precise azimuth and distance to the target but can't match them up.

When you get an azimuth in degrees, it means someone is taking the time to figure it out. (When you start receiving azimuths like "Northeast, northeast!" the operator is excited, under fire, and wants fires in a hurry. When he gives it in degrees, he is either very calm or taking his time, which means the azimuth is usually accurate.) Distances given by the ground unit are usually very accurate, except at night when fires look closer. At night you will not be concerned with marking by smoke. Since you can generally depend on the mapread-

ing ability of the ground soldier, look out when the target plot from the smoke doesn't make sense. Something is wrong. Check it out and you will usually find that the target plot is accurate from the lead elements, not from the smoke.

Eventually, you will begin to appreciate one more simple but important problem: sometimes you can't see certain colors very well. You will learn to select colors according to weather, terrain, and even the time of day. The basic colors you will work with are yellow, green, red, violet, (M18), and white (HC, A/N M8). The white phosphorous (WP) grenade has certain advantages, but is rarely used for ordinary marking.

In one example showing poor judgment, an armed helicopter pilot throw yellow smoke to mark a landing zone in a paddy area. The color is brilliant, and had been used successfully in several previous operations. However, there was a light fog in the area, extending up about 300 feet. Although it was very patchy and no obstacle to landing, a bright early morning sun glared harshly down on it. The lift aircraft were approaching out of the sun. The flight leader said he had the mark in sight, but he didn't. He only *thought* he saw it. He landed at what he thought had been a puff of yellow smoke. He was 2,000 meters from the selected landing zone, and the troops were several hours late reaching their first objective.

The armed helicopter pilot had used the wrong color. Any other color, except white, would have been better under the circumstances. Green would probably have been the best choice, because it shows up well in glare conditions.

The green smoke grenade has many applications. It will often

Did you expect red shamrocks?

provide much more contrast with surrounding terrain than yellow or violet grenades. Its color is unlike any found in nature. It's true that the plantations and rice paddies are green, but they aren't *that* green. You may be surprised by how easy it is to see a green smoke mark, especially in hazy early morning conditions.

Violet smoke is useful for other things besides training. It shows up well under most conditions, and fits easily into preplanned signals. It can really get you in trouble at twilight, though, when it is harder to see than any of the others.

Use of the white smoke grenade (HC) is limited by the fact that its smoke resembles that made by explosives, incendiaries, and burning paddy chaff. If incendiary ammunition is not being used in the area, the WP grenade provides a mark that is hard to miss, especially in darkness. You must have radio contact when WP grenades are used for marking. If you don't, you might find yourself landing under some artillery rounds or an air strike, since this grenade resembles rounds used for marking targets.

Any smoke grenade will last longer than HE for marking. This is true whether you are marking your own position or that of the enemy. It is even true when you are the one being marked with HE.

To stay in the operational area, it is necessary for the aviator to make turns. During the turns, he may lose sight of a friendly position. In heavy cover, especially jungle, a friendly unit may be located by mortar rounds exploding on top of them. If the rounds stop when the aviator is in a turn, he may lose reference to the ground unit. If the ground commander decides he has nothing to lose, he may find it to his advantage to mark his position anyway. The smoke grenade will enable the aviator to make his strikes that much faster. This doesn't mean the mortars will be eliminated. It means that more immediate dangers will be hit faster. The decision will depend on how much damage the mortars are doing through the canopy, and how well the ground unit can move to another position.

The humble smoke grenade can kill you if it goes off inside the aircraft. The usual reason for a smoke grenade igniting in the ship is an accident caused by a crewmember or lifted troops. When it goes off, the aircraft immediately fills with smoke. You will not be able to see outside the aircraft, and you will not see your instruments. The condition is not IFR flight; it is blindness. Flying in a hard crab will get rid of some of the smoke. The landing will be hard, and will probably occur before the grenade stops burning or is kicked out. Don't press your luck. Be sure crew members and passengers handle smoke grenades with care, and that grenades to be used during the mission are kept where they can be gotten rid of.

The smoke grenade is often going to be your first indication that something is happening in the air or on the ground. Streaming from the aircraft you are protecting, it will mean enemy fire, and fire to be returned. Billowing on the ground, it will mean more enemy positions to be struck, wounded men to be carried out, rations, water, the ammunition for people who need it. It's easy to use. All you do is pull the pin and let the handle fly off. That's the easy part. The hard part comes later, when you find out whether you used it *right*.

25th ANNIVERSARY CONTRIBUTION

centralized management and automation--
A Bold Step Forward At USAPHS

Colonel E. P. Fleming, Jr.
Commandant, U. S. Army Primary Helicopter School

TO MEET increasing demands for Army aviators in Southeast Asia, a rapid expansion in student training has been accomplished at the United States Army Primary Helicopter School. From July 1965 to July 1967 the monthly output of student aviators was increased from 96 per month to 386 per month. By February 1968 USAPHS will be graduating 584 students from the primary phase of training each month.

During the initial expansion period it became apparent the United States Army Primary Helicopter School could no longer operate under a decentralized training management concept. This concept had functioned smoothly when responsibility for all flight training had rested with a civilian contractor. The expansion resulted in a division of the 16 weeks of flight training conducted by USAPHS into two 8-week stages. The civilian contractor retained the responsibility for the first 8 weeks (Primary 1 Stage). A Military Flight Division was activated and given the responsibility for the second 8-week period (Primary II Stage).

Assumption of approximately 50 percent of the USAPHS training mission by the Military Flight Division established a requirement for an agency to allocate training resources impartially to the contractor and Military Flights. A Training Support Operations Center (TSOC) was activated on 22 May 1966, with the mission of allocating training resources to ensure that USAPHS training requirements were met. TSOC control over training resources included stagefields, training areas, airspace, and aircraft. Assignment of training resources was responsive to the smallest using unit, the flight.

As the school staff prepared for expansion, an evaluation of the entire flight training program was made in an effort to improve the caliber of training while reducing student attrition. This critical analysis of the training program indicated that a student would probably have a greater chance of successfully completing flight training if he flew every day.

The study indicated that students in the pre-solo stage of training should receive a minimum of one hour of dual flight instruction during each training day. Additionally, it was considered essential that no student, regardless of the stage of training, fly more than two solo periods in succession without a period of dual instruction.

Uniformity of training was considered to be highly desirable so a continuing analysis of the training program could readily isolate areas where poor student performance indicated a need for corrective action. To ensure the desired uniformity of training, a method of monitoring the progress of each student was considered a necessity.

Since the Fort Wolters Data Processing Center had the capability of supporting the USAPHS flight training program, experimental programing and systems analysis for an automated Student Flight Training Management System began in November 1966. Plans were made for an automatic data processing (ADP) program that would adjust training resource requirements automatically when adverse weather or maintenance difficulties resulted in a significant loss of student training time.

The planned program would also clearly define each student's daily flying lesson and provide for daily monitoring of the accomplishment of that lesson. In fact,

the planned system would be so precise that it would be possible, at any time, to determine where each of the 2,086 students were flying and what each was doing.

TSOC was redesignated as the Training Management Center (TMC) and its mission was changed to management of student training to ensure that training requirements were met. This mission included allocation of all training resources in addition to monitoring and analyzing the training accomplished.

On 9 January 1967 the Automated Student Flight Training Management System was inaugurated. A thorough orientation and briefing of all USAPHS personnel preceded this program and included the introduction of a new flight training syllabus which expressed the desired concept of training.

The Automated Student Flight Training Management provides the flight commanders and instructors with a daily student schedule which specifies the lesson the student should accomplish on the training day. In addition, a daily student activity printout reflects the student's lesson, grade and flying time accomplished the previous day.

The Daily Student Activity Report is supplemented by a Total Student Flying Time Report which indicates each student's total flying time, his last five grades and his flying time deviation from the flight syllabus. The Commandant's Report is also obtained on a daily basis. This program keys off the daily and total flying time of each flight in addition to the number of training days remaining for the flight to complete the stage of training, the weather days that the flight can expect to lose, and the number of aircraft assigned to the flight for the last training day.

COL William T. Schmidt (right), assistant commandant of the U. S. Army Primary Helicopter School, discusses student training progress with MAJ James Hegdahl, chief, Training Management Center. On wall before them is microfilm viewer which is used to review student data provided TMC by the Automated Management System

The Commandant's Report is extremely valuable to the commandant and management and supervisory personnel, because it portrays the accomplishments of each flight in residence. This includes the total time flown, time flown per aircraft, assigned and average time flown per student. Additionally, it indicates the average time deviation from syllabus per student, total time remaining to be flown by the average student, and the time that the student needs to fly each day to meet graduation requirements. The Commandant's Report also indicates the number of aircraft by type that each flight needs on a daily basis to graduate all students in accordance with the established program.

The centralized system of management, using the automated student flight training system as a tool, has proved its value at USAPHS. Improved quality and timeliness of command information and management control data have caused student flight training to progress uniformly. Standards of training have been raised because supervisors at all levels are able to check the progress of each student on a daily basis. All indications are that attrition resulting from flight deficiencies will be lowered. Maximum use of aircraft and facilities has been obtained, and higher aircraft availability rates provided by making more aircraft available to maintenance within predictable time frames.

Systematic planning for the effects of adverse weather and training holidays has allowed USAPHS to complete training requirements for all students, on schedule, while resorting to weekend flying on only one occasion since 9 January 1967. This record is more significant since only 25 percent of the flights in residence flew that weekend.

Through continuing analysis of the USAPHS training program and careful evaluation of student training data, USAPHS will continue to elevate its standards of training. At the same time improved efficiency will result in greater economy throughout the training program. USAPHS training will remain firmly oriented on the student, steadfast in its determination to graduate each class at a higher degree of proficiency than that of the preceding class.

They Come To Us As "Pilots" And Leave As Army Aviators

CW2 Robert A. Hlubin

Students in the Department of Tactics at the U. S. Army Aviation School are assigned to companies operating as regular line units. Four weeks later they are graduated as Army aviators

THEY COME to us as experienced student pilots. Their training: 28 weeks of going to classrooms a half day and to the flight line the other half, plus anything they can read about flying in their spare time.

Twenty-eight weeks in basic aerodynamics, navigation, meteorology and maintenance.

One hundred eighty-five hours working on hovering, takeoffs, approaches, traffic patterns, forced landings and autorotations, instruments and some confined area operations.

After all of this training we now have a helicopter pilot proficient in his aircraft. But, surely, thousands of dollars worth of training were not spent on this man just to learn this traffic pattern work. Now is where one of his most important phases of training comes into action, rotary wing tactics and employment. All of the ability is there; now the pilot must learn how to use it to best advantage. Now everything will start to fit into place like a puzzle to be put together to form a picture of an Army aviator.

In the Department of Tactics the student becomes a member of a company of the "129th Airmobile Battalion." No longer does he use the aircraft number as his radio call sign; rather he is assigned a tactical call sign. The company that he is assigned to has a unit nickname or call sign the same as a regular line unit.

There are no instructors in this phase of training; they are experienced aircraft commanders. But then instructors are not needed because there are no students, just the "new pilots" who have joined our unit.

As with every unit the new pilot is given an SOP to be thoroughly familiar with and a battalion SOI. Both are in a pocket-size form to be carried at all times for ready reference.

All instruction in the Employment Division is given as missions, rather than just instructor-student planning. For the first 12 days the missions are broken down into training orders of approximately 1 hour and 15 minutes each. Five of these training orders are with the aircraft commander and four are solo missions. All are distributed in advance.

These training orders have all information to accomplish the mission, a map overlay of the routes and units, tactical situation, mission, execution and concept of operation, administration and logistics, command and signal, and movement table. All landing zones have "units" located there, and frequencies and call signs are found in the battalion SOI. Landing instructions and local enemy situations are obtained through these units. (These locations are usually manned by two pathfinders who operate radios and set up panels and markings in the landing zones.)

All of the maneuvers are planned into the missions, with the exception of external loads, night formation, and contour flying. These are set up so they are done once with the aircraft commander aboard for demonstration and practice and then done with just the two new pilots aboard, giving them the chance to try it on their own.

Also in these first 12 days is the gunnery familiarization course in which the pilot gets to fire live ammunition from a helicopter.

Teamwork is one of the most important products of this tactics phase and here is where it really starts to show.

No longer does a student start the aircraft under the watchful eye of the flight instructor. Now the pilot and copilot-navigator start the aircraft as a team and even use the aircraft commander as necessary.

In flight the navigator-copilot is continually monitoring gauges, giving the pilot directions in heading and altitude, and in formation monitoring coordination and proximity of other aircraft. A passenger in the aircraft might have trouble deciding who the instructor is, with all of the commands and corrections going on between the three people up front.

Now the pilot learns a new way to make his approaches. No longer is the traffic pattern made with a 500-foot downwind with descent to 300 feet on base and an approach started at 300 feet and 60 knots. Instead the pilot learns to make low level approaches from 50 feet to 100 feet altitudes and whatever airspeed he may have, or a circling approach around his secured landing spot from any altitude up to 2,500 feet. He also learns about corridors for landing under tactical situations.

Upon reaching his unit "Home Plate," Tac-1 or Tac-X, the new pilot realizes that there are no more stagefields with paved landing lanes; instead his tactical airfield is just an old pasture with landing Ts and parking stalls around the perimeter. From there all of his missions will just take him to other smaller fields and simulated outposts.

In these first 12 days the new pilot tries his hand at formation flying, both dual and solo, low-level flight and navigation at 50 feet above the trees, contour flying at 10 feet above the trees, and operations with sling loads.

Most of this work is done by platoons working different areas assigned to them, using their platoon radio frequency for air to air communications and flight following en route.

On the 13th day starts the most interesting part of tactics training, the field exercise.

The FEX lasts seven days with a two day weekend break between D+2 and D+3. At all other times the new pilot and his aircraft remain at the tactical airfield that his company is assigned.

On D-day the new pilot is informed to report to Lowe Army Heliport for further orders. His only additional information is that he will be required to remain in the field and a list of items of field gear to pick up from supply before reporting. No longer does he get training orders in advance; instead, he gets operations orders as the tactical situation develops.

His first operations order is the movement of his unit and aircraft from Lowe AHP to his area of operation at one of the tactical airfields.

From this point on the new pilot receives his briefing and operations orders from his operations officer just before the flight with less time for plotting overlays, until checkride day. Then he will be expected to plot his mission in 15 minutes and be able to pick up a change in mission at a command post and be airborne in 3 minutes.

Also at this time his aircraft commander starts to become rather uninformed as to what is going to happen next. After a morning flight, the new pilot may ask his aircraft commander if he will be flying this afternoon or evening. Even though the instructors know what will be happening for the rest of the problem, his answer will be: "I don't know. Check with your section leader or operations officer for any further instructions or briefing times."

After each mission the new pilot will be debriefed by his aircraft

Students undergo a gunnery familiarization course

Students try their hands at low-level formation flying

commander and platoon leader as to his part in the operation and how the platoon as a whole accomplished their part of the mission. He will also receive reports on how the whole operation worked out as to casualties and degree of success.

On this FEX the student will perform in all phases of an airmobile assault. As a member of the internally loaded platoon he will get a chance to carry a 1,400 pound actual load into a landing zone in formation. As a member of the external platoon he will deliver a 1,000 pound sling load to an LZ in formation. As a member of the armed platoon he will get to escort the externally loaded aircraft into hot landing zones plus recon an area. In these cases he will receive fire from ground personnel firing blank ammunition.

He also makes a formation approach from above 2,500 feet and a return to Home Plate under tactical instrument conditions with a tactical ADF approach and GCA.

The new pilots also get to plan and execute airmobile assaults solo with just a couple of instructors to critique and debrief after the mission.

There are also single ship resupply missions, both day and night solo, and a night airmobile assault demonstrated by the aircraft commanders, using two complete companies and landing in areas lit only by a perimeter of burning flare pots and fires. All night missions are made to small fields lighted by pathfinders with flare pots, vehicle lights on panels, or just flashlights.

There is also an eagle flight for which there is no formal briefing. The signal is a long blast on the siren or vehicle horns. All pilots on standby at the time scramble to their aircraft and are briefed in flight by the company commander and platoon leaders and perform an airmobile assault.

The final climax to Tactics instruction is when the aircraft are returned to Lowe Field on the final day of the FEX. The 129th Airmobile Battalion executed a battalion graduation flyby down 5th Avenue of Fort Rucker. The flight is done solo with direction of the battalion commander, company commanders, and aircraft commanders sitting in lead and trail ships only. The companies are in formation with one minute separation between companies.

This is the day that wives turn out to watch the class fly over, children wonder which one is Daddy, farmers stop to look up at the finished product of what has been scaring their chickens and cattle all month, and disinterested bystanders look up and are proud and thankful that this is a U. S. Army aviator.

This is also when instructors leave their desks, where they have been putting the finishing touches to flight records that will be closed out upon landing of these pilots, to look at their finished product, what they have accomplished in the past four weeks, with a hidden inner pride. And then pride turns to regret when he remembers that come Monday morning he will meet another class of students who know nothing but normal takeoffs, normal approaches, traffic patterns, etc., etc., and he has to start working on this puzzle all over again.

But looking up at the flyby is also what has inspired this instructor to write and let the rest of you aviators know what we are doing at the United States Army Aviation School.

YH-18
MANUFACTURER SIKORSKY
ENGINE AIRCOOLED 245 HP
SEATING 4 PLACE
GROSS WEIGHT 2400 LBS
EMPTY WEIGHT 1650 LBS
USEFUL LOAD 750 LBS
CRUISE (55% POWER) 76 MPH
ENDURANCE 3.4 HRS
RANGE 250 MILES
RATE OF CLIMB 1300 FT/MIN
SERVICE CEILING 15500 FT
HOVERING CEILING IN GROUND EFFECT 9200 FT
HOVERING CEILING OUT OF GROUND EFFECT 5900 FT

By 1946 it became evident that a need existed for a test organization in Army aviation. Consequently a Ground Aircraft Test Section of Army Field Forces Board No. 1 was established at Ft Bragg, N. C. Above, the YH-18 on display while undergoing tests at Board No. 1 in 1950

History of the U. S. Army Aviation Test Board

Jake Fortner

THE ARMY HAS been testing aircraft and associated equipment almost since the invention of the airplane. Army aviation as we know it today was born early in 1942 as a result of tests which were recommended by MG Robert M. Danford. His recommendation stemmed from an article written and published in the *Field Artillery Journal* in May 1941. The article was written by MAJ William W. Ford on the use of light, commercial type airplanes in Army maneuvers.

This test was preceded by an assembly of officers, enlisted men, and civilians at Fort Sill, Okla., in January 1942 for training in preparation for the test. The civilians were used as flight instructors and to supervise the maintenance of 24 standard J3 Cubs which had been painted olive drab and provided for this test.

Pilot training, which included aircraft maintenance training, was completed on the last day of February 1942. Two separate units of officer and enlisted pilots reported for tests—one to the 2nd Infantry Division at Fort Sam Houston, Texas, and the other to the 13th Field Artillery Brigade

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at Fort Bragg, N. C.

Boards were appointed to observe the tests, and their reports to the War Department highly recommended organic aviation for field artillery units. These recommendations resulted in the birth, on 6 June 1942, of today's Army aviation when the War Department actually established aviation organic to field artillery units.

The Department of Air Training was organized at Fort Sill, Okla., as a part of the Field Artillery School. Even though the primary mission of the department during World War II was to fulfill the expanding wartime need for this new Army capability, it soon became apparent that testing of aircraft, aircraft use, and equipment associated with aircraft use was a necessity if this new Army capability was to be fully exploited. Such tests ranged from a small, simple tool to comparative evaluation of different manufacturers' aircraft.

For example, a maintenance problem existed where the push rod housing entered the rocker box on the old 65-hp Continental engine, because this particular point leaked oil almost continuously. Sergeant Martin, a machinist then assigned to the Department of Air Training designed and fabricated a special tool to alleviate this problem. Testing of this prototype tool proved its effectiveness and Sergeant Martin then had a full-time job manufacturing the special tool.

Another example of ideas and tests resulted from the thought that the Cub could rapidly lay wire for a telephone communication network. A device which would hold a standard reel of telephone wire was designed and built by Sergeant Martin. With this fairly simple device, it was proved that wire could be laid effectively from a Cub.

The enthusiasm of aviators to try new horizons resulted in determining whether the old L-4 could be used to drop bombs. However, some question existed as to the amount of lateral control that would remain if a bomb were hung under each wing of the aircraft and only one was dropped. Therefore, the Department of Air Training installed two bomb racks with two empty bomb cases at the juncture of the lift struts to each wing. Starting with a small amount of weight in each case, the aircraft was flown and one case was dropped. Weight was gradually added to the cases and the procedure was repeated until maximum weight was obtained without losing lateral control of the airplane. The exact results, insofar as maximum weight is concerned, are not remembered, but it was proved that a reasonable amount of weight could be handled asymmetrically by the L-4.

Of course, the Army was looking ahead and thinking in terms of additional types of aircraft for use by the field artillery. One of the tests conducted by the Department of Air Training was a comparison of various types of light aircraft to determine the most suitable type for field artillery observation.

Movement of personnel and aircraft on TDY to more desirable test sites was also necessary for the Department of Air Training. As a result of Army liaison pilot operations in Europe and the Pacific, some question existed as to whether light aircraft could successfully evade searchlights at night and, therefore, evade being spotted and shot at by antiaircraft batteries. As a result, a test was ordered at Fort Bliss, Texas, to provide information on this subject. The results of this test indicated that the L-4 and L-5 could do little to avoid searchlights at night.

Suffice it to say that activities other than those of training by the Department of Air Training indicated a need for a test organization in Army aviation. Therefore, in 1946 a Ground Aircraft Test Section of Army Field Forces Board No. 1 was established at Fort Bragg, N. C. In addition to the Ground Aircraft Test Section, the Board had other divisions, namely Airborne Test Division, Communication and Electronics Test Division, and Field Artillery Test Division.

Nine years later in June 1954, the Field Artillery Service Test Division and the Army Aviation Service Test Division were moved to Fort Sill, Okla., and this group was reconstituted Board No. 1, which exists today as the U. S. Army Artillery Board. The Communication and Electronics Service Test Division and the Airborne Service Test Division remained at Fort Bragg as Board No. 5, which also exists today as the U. S. Army Airborne, Electronics and Special Warfare Board.

In October of 1954, the Army Aviation Service Test Division was again moved—this time to Camp Rucker, Ala., where the Army Aviation Center was being organized. At this time the unit was placed under Board No. 5 at Fort Bragg for administrative purposes.

Early in 1955 it became apparent that the division was being swamped with a tremendous amount of testing required by Army aviation due to an increase in scope, size, and importance of organic aviation within the Army. A decision was made to expand this division into a full board, and on 1 August 1955, Continental Army Command Board No. 6 was organized as a Class II activity at Fort Rucker, Ala. Colonel Robert R. Williams was designated as the first president.

At about the same time, action

After the Army developed its first aircraft (the L-15, above) the test facility at Ft Bragg found it unsuitable

was being taken which resulted in the establishment of two additional Class II test activities at Fort Rucker under their respective technical services—the U. S. Army Transportation Aircraft Test and Support Activity (USATATSA) and the U. S. Army Signal Corps Aviation Test and Support Activity (USASCATSA). These activities had similar missions of performing logistical testing for their respective technical agencies and providing specialized supply and maintenance support to Board No. 6.

In January 1957, Board No. 6 was redesignated as the U. S. Army Aviation Board. As a result of reorganization of the Army in 1962, the Board became a part of the U. S. Army Materiel Command (USAMC) under the direct jurisdiction of U. S. Army Test and Evaluation Command (USATECOM) at Aberdeen Proving Ground, Md. In addition, USAMC directed that the three aviation test activities at Fort Rucker be consolidated.

Consolidation with USATATSA was accomplished in September 1962. However, reorganization was not completed until April 1963 at which time USASCATSA also was consolidated with the board. By then the "Corps" had been dropped from the name and the designation was USASATSA. In the interim, on 1 December 1962, the U. S. Army Aviation Board was redesignated the U. S. Army Aviation Test Board (USAAVNTBD).

Space will not permit a rehash of the tremendous number of projects that have been handled by the Army Aviation Service Test Division and later by the USAAVNTBD. These can be highlighted by pointing out that after the Army developed its first aircraft (the L-15) specifically tailored for Army use, the test activity at Fort Bragg found it unsuitable. A finished article competition was held in 1947 at Fort Bragg which resulted in the selection of the L-17 as the first mission support aircraft. The L-19 (O-1) Bird Dog came into being for the Army as a result of a finished article competition of off-the-shelf aircraft at Fort Bragg in 1950. Over 3,000 of these aircraft were purchased by the Army. The Bird Dog is still in use as a fixed wing trainer and for observation and fire control missions in Vietnam.

As an indication of the increase in size and scope of the Aviation Test Board, USCONARC Board No. 6 in 1956 operated on an annual budget of approximately $58,000. The current annual budget of the Aviation Test Board exceeds $6,000,000. Today the board is organized into three basic elements: command, support and test. The various units throughout the board are hardware oriented for testing of aircraft, aircraft armament, avionic equipment, and associated equipment such as maintenance workstands, shelters, personal equipment, etc.

The number of active projects assigned to the Aviation Test Board generally exceeds 100 with something less than 50 percent of these normally in the test phase with the others being either in the planning or reporting phase. Projects range from test of small items such as a particular type of spark plug to major effort type tests such as flying three CH-47A helicopters for 10,800 hours at a rate of 150 hours per month per helicopter. This latter test has been very instrumental in proving dynamic components of the CH-47A and extending the service life of such components in aircraft deployed to Vietnam.

The future of the Aviation Test Board will be controlled by the future of Army aviation. Test of new equipment is essential for progress of Army aviation. Such tests are oriented and will continue to be oriented toward providing Army aviators, mechanics, and support elements with the best possible hardware in the world consistent with the Army's operational requirement for aviation.

CONTROLLED EXPLOSION

Major Robert M. Shabram **CW4 Harold L. Deal**

The "booming" flying hours at the Aviation School and Center at Ft Rucker, Ala., brought about many problems that overshadowed the desirable features of decentralized training. An Aircraft Management Center was the answer in the form of coordinated and efficient management, scheduling, utilization, and accounting of all aircraft assigned to USAAVNS

THE WORD "explode" best describes the change of the U. S. Army Aviation School flight training program from 19,000 flying hours in December 1965 to over 70,000 flying hours in May 1967. Exploding the size of the program 3½ times in an 18-month period resulted in a requirement for over 1,000 aircraft of 13 types, in 72 models, with 23 separate configuration requirements, to fly over 800,000 hours each year. The school's aircraft inventory, valued in excess of $176,000,000, requires over $20,000,000 in maintenance contracts for support. This fleet provides each of the 2,400 students in over 65 flight training sections the exact aircraft needed for a specific phase of training.

How do you control such an explosion? How can you stay ahead of the shock wave? How do you eliminate the domino effect of one problem area affecting other areas? These and the many other problems faced by the staff and faculty at Fort Rucker were met with the same sense of urgency as displayed by the aviators in Vietnam in meeting the challenges to Army aviation in the combat situation.

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This sense of urgency led the several departments and staff agencies to conduct critical study of all areas to determine if the systems of operation would be adequate to meet the requirements of the expanded program.

It became obvious that the desirable features of decentralization of training to each flight training department would be overshadowed by problems in using the training resources. There was need to revise systems of communication, coordination, and control to meet current needs. One major step toward this ob-

jective was the establishment of the Aircraft Management Advisory Committee in November 1965. The Chief of Staff is the chairman of this committee. It is composed of the ACofS, G3; Comptroller; ACofS, G1; Director of Instruction; and the Deputy Chief of Staff for Logistics.

The committee acts upon matters pertaining to aircraft resources and initiates actions to improve efficiency in operations.

To assist the committee and to provide a full-time action office to coordinate the scheduling and use of USAAVNS aircraft an Aircraft Management Center was created. The Aircraft Management Center is composed of representatives from the office of DOI, DCSLOG, and the civilian maintenance contractor. Additionally, direct "hot line" communication to each flight training department operations, and maintenance operations at each airfield, facilitates immediate coordination to cope with daily operational events. The center relies upon the capability for immediate coordination to accomplish its mission of providing the coordinated and efficient management of the maintenance, scheduling, utilization, and accounting for all aircraft assigned to USAAVNS.

In functioning, the center compares the flight training program for each of the 28 separate courses of instruction with the aircraft requests from the flight training departments. Requests are submitted five weeks in advance of training and are updated until the day before training. The requests are referenced against the status of training of each class in residence, and against the support facilities and budgets. The maintenance contractor tailors his support program and advises of problem areas.

By starting coordination five weeks in advance and revising the schedule as contingencies occur, the capability of providing the proper aircraft by configuration is increased. Consideration is given to such items as weapons systems, Decca navigator radios, and internal loads. Detailed coordination is essential to ensure that on a specific date the proper number of subconfigurations can be provided from the flyable aircraft within a fleet.

At one airfield alone, the fleet of nearly 300 UH-1s is scheduled to provide as many as seven specific subconfiguration requirements on a given day. This means the maintenance contractor is concerned with providing more than just a percentage of the total fleet; he is also concerned with the availability of the UH-1s by configuration for a specific day.

As the schedule is developed, and coordination is conducted, maintenance forecasts the specific availability by configurations such as the Decca navigator radios. If Decca navigators will not be available at a base field in the number requested on a specified day, the Management Center and the training department respond by using an aircraft with a Decca navigator from another base field, or by revising the schedule to defer the requirement to another day.

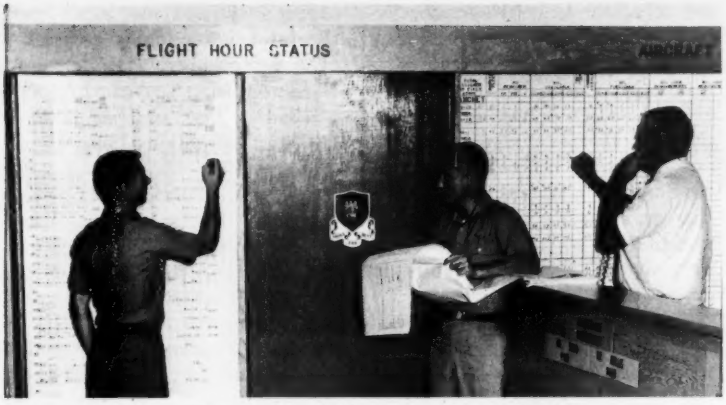
Developing a valid schedule is only one portion of the activities of the Management Center. The center evaluates the total operation through a daily analysis to evaluate progress and determine areas requiring action to improve efficiency. The analysis is based upon a Daily Flying Hour Report developed by the Data Processing Center. DA Form 2408-12, Army Aviator's Flight Record, from each aircraft used at the school is processed for the computer program each night. The report is available to the Management Center the following day to provide data required for determining the status of training of each of over 65 training sections in residence, the status of the 70,000 hour flying hour program, and the use of the $176,000,000 of aircraft resources.

Command emphasis on systems improvement and close coordination between all departments and agencies led to significant accomplishments. These accomplishments have been recognized in the November 1966, Department of the Army letter on management practices and in civilian management publications.

When comparing data on the UH-1 helicopter fleet in August of 1965, before the first major systems revision, with data on the UH-1 fleet in August of 1966 significant results are evident, as shown in the chart below.

These results illustrate that the expanded flight program requires integration of flight training and maintenance support programs to

UH-1	*August 65*		*August 66*	*Gain*
Mission ready availability	A Model	55%	64%	+9%
	B/D Model	63%	70%	+7%
Average hours flown per flight request	1:40 hrs		2:15 hrs	+:35
Percent flown of flights requested	68.7%		90%	+21.3%
Average hours flown in August per assigned helicopter	57.3 hrs		70 hrs	+12.7 hrs



Detailed coordination makes the Aircraft Management Center effective

achieve desired efficiency. Continued coordinated efforts have led to new areas of systems development.

A further step in integrating flight training and maintenance support was initiated on the fleet of UH-1 helicopters used to support training conducted by the Department of Rotary Wing Training and the Department of Tactics. The training departments request aircraft by the desired configuration, identifying the number of hours to be flown on each helicopter with the required configuration to the number of hours scheduled. A helicopter is selected that "should" fly the hours scheduled, to be in accord with the maintenance support program. After the aircraft are flown, an automated flight analysis provides data depicting the aircraft utilization and the causes of variations from the flight hours scheduled.

From the experience gained in this program, it has been determined that when the more advanced data processing equipment is available greater efficiency can be achieved through greater integration of training and support programs. Steps have already been taken by the flight training departments and by maintenance that can lead to an even better system. This system will integrate flight training and maintenance support by assigning a specific helicopter by serial number to a specific student by name; provide the instructor with a choice of four lessons to teach the student; and designate the number of hours to be flown that will facilitate the flight training and maintenance support programs.

The Aircraft Management Center has helped to control the explosion of the flight training program. It operates on the principle of centralized control and decentralized implementation. It has provided substantial benefits in terms of aircraft utilization, leveling peaks and valleys in flying hours, and has aided in the overall mission accomplishment throughout the period of the explosion.

ARMY'S OLDEST HUEY IS WIA

AFTER A YEAR and a half of rugged combat duty with the 1st Air Cavalry Division in Vietnam, Helicopter 107, the oldest Huey chopper in the Army inventory, has been wounded. It was the first time 107 has been hit by enemy fire.

Her history goes back to the beginning of Army use of UH-1 helicopters in 1962. She was one of the test ships used to establish the feasibility of helicopters in the Army. After extensive testing at Edwards Air Force Base, Calif., 107 was shipped to Alaska to undergo tests in a cold climate.

After brief stays at Fort Hood, Texas and Fort Rucker, Ala., 107 joined the 1st Air Cavalry's 227th Aviation Battalion and came to Vietnam in September 1965.

She has participated in every major 1st Cav operation, always emerging from the thickest battles unscathed. Then during Operation Pershing she took a bullet through the tail on the Bong Son Plain. The hole was patched, a new coat of paint applied, and 107 resumed duty.

"No one is afraid to fly 107," said MAJ Jimmie B. Kinder, commander of Company B, 227th Aviation Battalion. "She's still one of the best."

Final CH-21 Maintenance Class

SELDOM DO YOU pass a Model T on the road without someone saying, "Boy, they really built an automobile when they made her." So it is with the CH-21. Few people doubt she no longer offers what is needed for Army aviation, but she proved her worth time and again no matter what the odds.

On 13 July 1967, amid the laughter and contemplation of new assignments, 30 graduating maintenance personnel unofficially marked the not-too-distant demise of the CH-21. It was the last such maintenance class to be graduated at Fort Rucker. Three years earlier, the last pilot class had graduated on 20 July 1964.

But all was not laughter and gaiety. One instructor, who obviously had reaped the benefits of her feminine stubborness many times, was heard to say, "I hate to see her go. She was a fine helicopter."

This "Grand Ole Dame," as she is sometimes referred to, began her memorable career with the Army in 1954, and in 13 years of flying may well have earned the title of "First Lady of Army Aviation."

On 21 November 1961, twenty CH-21s left the west coast aboard the *USS Core*—the first U. S. Army helicopters bound for Vietnam. Three weeks later, at a Saigon dock, they noisily rose into the air to begin a new phase of the Vietnamese war. They promised all who were fighting there a better chance of survival.

Little more than a month later the CH-21 was given her first real opportunity to prove the worthiness of rotary-winged aircraft in combatting the guerrillas—a test she passed with (pardon the pun) flying colors.

As the sun rose above the horizon the Saigon International Airport (homebase for the pioneer aircraft) was a beehive of activity. Pilots and crews were carefully examining their aircraft, while Vietnamese paratroopers methodically prepared for boarding.

Finally the time was right. Thirty CH-21s shattered the silence as they rose into the air like a drone of mammoth bees. Thus began the first heliborne mission of the Vietnam war. . . . The helicopter was in.

Attempts were soon made at arming the 21s, but by this time the blush of youth had left her cheeks and age was beginning to show. Meanwhile a new generaton of helicopters was proving its worth stateside and soon would be joining the efforts in Vietnam.

In 1962, after it was determined the 21s could not be sufficiently armed, the first armed support unit was assigned for escort use. The Hueys darted around the 21s like chicks around a mother hen, making her cargo missions even more effective than before. No longer were the big ships easy targets for insurgent forces.

But, even bigger and better things were happening in the states. Boeing-Vertol, who with the assistance of Piasecki developed the CH-21, had come out with a new tandem-rotor cargo helicopter, the CH-47A Chinook. The lady's days were numbered. She was going to have to make way for progress.

Ironic as it is, late in 1964 LTC Robert Dillard, who first introduced her to her Far-Eastern home, flew old 049 (one of the original CH-21s) on her last Vietnam flight to be shipped back home.

Though 21s are still in the Army inventory, and she continues to perform magnificently, her role has been tempered to her age.

She wasn't always easy to get along with, but women seldom are. There are those who say she was built with her nose in the air for a purpose. She may no longer be "top banana," but you can bet she'll never lose appeal.

BODY ARMOR AND FRAGMENTATION WOUNDS

The number of serious wounds caused by fragments of "hot lead" spattering off body armor triggered a field test which resulted in an interesting solution

THE MISSION was a combat assault into a hot LZ. The slicks were just about to touch down when a round blasted up through the left chin bubble of the Huey and slammed dead center into the copilot's chest protector (armor, aircrewmen, small arms protective, front with carrier). The chest protector worked as advertised and one highly trained aviator's life was saved.

That should have been the happy ending of the story; unfortunately it was not. The round impacted on the chest protector and a secondary metallic fragment tore into the aviator's knee joint and put him out of action for a week.

In a similar incident a round struck the pilot's chest protector and did not penetrate but fragmented. One of the jagged pieces of red hot slug spattered off the chest protector and slashed into the copilot's eye, destroying it.

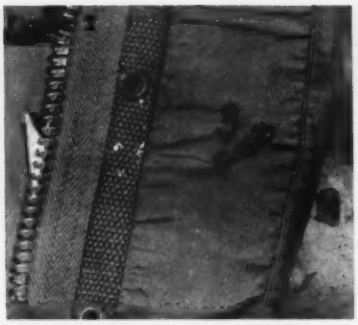
The frequency of such incidents as these generated the need for a study to determine whether a significant number of injuries occurring from ricocheting secondary metallic fragments formed when rounds impact on the chest protector could be prevented.

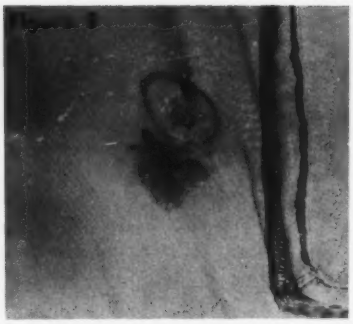
With the aim of finding a practical solution to this problem, a field test was conducted at the request of the 12th Combat Aviation Group commander. The tests consisted of firing an M-14 rifle with 7.62 mm ball ammunition from a range of 150 meters at various flak vest (armor, body, fragmentation, protective, upper torso) chest protector configurations.

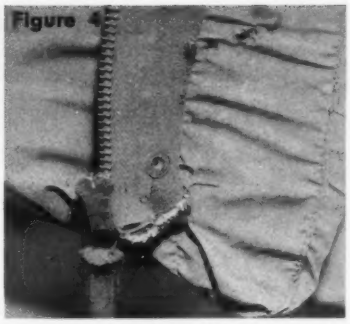
To demonstrate that metallic secondary fragments do result from rounds impacting on, but not completely penetrating, the chest protector, rounds were fired at chest protectors without flak vests worn outside them. Cardboard posterboards were placed one foot laterally and parallel to the line of fire on both sides of the target. A typical example of the elliptical fragment patterns that resulted measured 10″ x 24″ and left fragments embedded in the cardboard.

Test results proved conclusively that these secondary fragments can very effectively be trapped by the flak vest when it is worn outside the chest protector. Figures 2, 3 and 4 are views of the outer surfaces of flak vests which were worn external to the chest protector and show the clean holes of entry through which the rounds

Figure 1: The front of a chest protector which had no flak vest worn external to it, demonstrating effects of secondary metallic fragments







Figures 2, 3 and 4 show the outside of flak vests when they were worn external to chest protector. Clean holes of rounds entering and the lack of patterns created by secondary fragments demonstrate the fact that these were absorbed by and hence did not penetrate the flak vests after ricocheting off the chest protector

penetrated, continued to strike the chest protector, and there burst into fragments. Figures 5, 6 and 7 are views of the inner surfaces of these same flak vests and show the pattern formed when the resultant ricocheting secondary fragments are trapped inside the flak vest.

Referring to figures 2, 3 and 4 again, one notes the absence of any patterns of fragments emerging from the outer surface of the flak vest, thereby demonstrating the failure of these secondary ricocheting fragments to exit the flak vest. In fact, during the entire duration of the field tests when the flak vest was worn outside (external to) the chest protector, it completely stopped the fragments from penetrating outward.

Figure 1 shows the front of a chest protector which had no flak vest worn external to it. The round struck the anterior midline slightly below the pocket, and the resultant secondary metallic fragments ricocheted upward, slashing the pocket to ribbons. Had this been worn by an actual person, the fragments would have torn into the wearer's neck, chin and face. With a flak vest worn outside his chest protector all this aviator would have had as a result of this episode was a good story to tell at Happy Hour instead of a neck or face full of shrapnel.

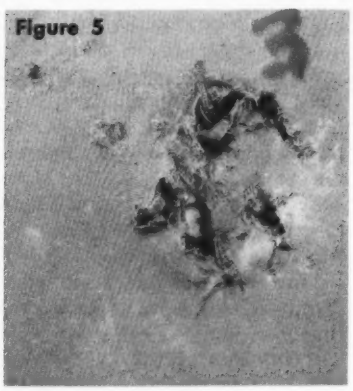
The lessons learned in the field tests are clear:

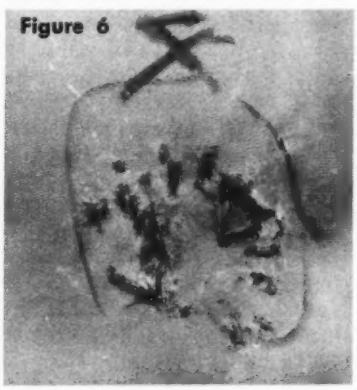
• The flak vest worn with and external to the chest protector will absorb ricocheting secondary fragments.

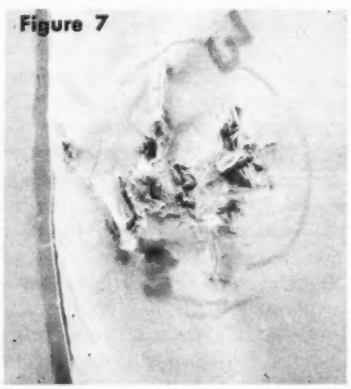
• The flak vest worn inside and under the chest protector serves no useful purpose. Rounds that do penetrate the chest protector will also penetrate the flak vest. Rounds fragmenting off the chest protector will create dangerous fragments which can wound the wearer or others in the aircraft.

The choice is clear: Either wear the flak vest external to the chest protector or don't wear the flak vest at all. With the flak vest outside you may be a bit warmer and more uncomfortable, but you'll be safe from fragmentation injury. With no flak vest you will be a little more comfortable, but will run the very real risk of subjecting yourself or others in the aircraft to potentially serious fragmentation injuries.

Three views of the inner surfaces of some flak vests as in figures 2, 3 and 4 show how secondary fragments were absorbed by jacket







Anybody See The Ground

Captain William D. Swift

Captain Curtis J. Herrick, Jr

CEASE FIRE — we're friendlies!" This phrase can cause a chilling, sinking feeling down deep inside. It sort of lets all the air out of your insides and leaves you a helpless, shameless, quivering vegetable behind a gun platform that you no longer wish to employ. A far cry from moments ago when you, with your scarf streaming from your neck, were searching the landscape below for traces of the villain like Snoopy on his Sopwith doghouse after the Red Baron.

"Curses, foiled again!" is fine for Snoopy as he drifts to earth suspended beneath a white canopy, but it's not quite consoling enough for you and me as our buddies on the ground lay stunned, wondering why their guardian angel turned out to be the grim reaper.

Think that maybe just a few seconds more coordination with the man on the ground might have prevented such an occurrence? Possibly a look-see at a closer range might have shown you that the "target of opportunity," the once in a lifetime shot at a band of Viet Cong in the open, was really a long range friendly patrol. Could it be possible that just a 15-minute talk the night before with the ground force commander or the U. S. ground advisor to the ARVN might have prevented the mistake you have just made?

How many of us tankers, infantrymen, artillerymen, transportation, signal or engineer types have served our time on the ground in the position our nonflying contemporaries now find themselves in? Very few of us, I'm sure. Therefore, it just might pay a little for those of us who have the honor of shepherding the magic carpet of Army aviation to give a little time and effort to better work with those on the ground.

OK, that's all fine and dandy to talk about, but how do we do it? Some say that aviation will still be misused by that same commander who has given us a hard time for years. This is all very true, but we can still make recommendations. Besides we might

Troops?

win over some of his subordinates, and that will make it easier for a few of our buddies later on.

A "can do" attitude along with a cheerful, helpful voice coming out of the ground commander's PRC-10 will do wonders to his morale. If he doesn't give you enough information to help you in your attack, ask him pleasantly for more. Don't yell at him and scream that if he can't give you more information than he's putting forth, you'll pack up your marbles and go play elsewhere. Besides, he is probably in a much more harassed position with his face in that sweet smelling mud than you are upstairs listening to the Armed Forces Radio station. If you treat him right the first time around, the next time you work with him you'll suddenly find things a little easier.

Believe it or not the operation has been run that was well coordinated both before, during, and critiqued after. In fact, usually every operation run in this specific area was well coordinated throughout. Of course, you want an example, well we're prepared to give it to you. After all, no experience is better than your own.

The operation I'm speaking of was conducted in the Phuoc Thanh special zone, better known as war zone D, in late October 1964. As usual, upon takeoff all that was known was that the mission would be in support of the Vietnamese 48th Regiment. However, as soon as a typical outstandingly executed touchdown was made at the 48th HQ at Tan Uyen, the situation changed immensely.

Even though it was but a short walk to the 48th briefing room, the ARVN CO's jeep was waiting to convey the fearless fighting men of the sky safely over the tiring distance to conserve their strength. Also, there was the chance of taking a wrong turn and ending up being debriefed by the wrong side.

Many smiling faces met you at the door as you entered, giving you the feeling of importance and standing — something that is sometimes forgotten by some people in our own Army. However, your confidence and good feeling in your stomach soon reversed as you prepared to sit down for the briefing and was suddenly thrust a glass of sorts with coffee of sorts steaming within it. But considering what possibly you had drunk the night before at the Van Canh or Capital Bar it couldn't possibly kill you, and probably it would kill any ulcer you had accumulated over the past few months anyway, so on to the briefing.

Thrust into the hand that wasn't clutching the coffee was a plastic covered map of the operational area. Ho Boy! Cheap Charlie is really cleaning up in this war. Well look-a-here, on the overlay was the whole battle plan, showing the locations and operations to be conducted by two battalions of the 48th Regiment, the supporting artillery, and displacement of the armed helicopters and logistics support.

Right there in front of you was the plan for the third battalion to make a forced march on the first day to join the first battalion at Binh Ca for a sweep the next day toward the Binh Dong province border north of Ben Cat and swing on around north of Binh Me for the night. The third day the sweep would continue west of highway 16 and end with a move back to the respective battalions' posts.

And what do you know? There was even the supporting artillery's locations: two 155s at Tan Uyen, two 155s at Ben Cat, and two 105s at Ap Bo La. Now what more could we ask for? Now here we run into problems. Several commanders will not allow the aviators to copy their maps as far as the battle plan, much less give them copies, for the simple reason that if the aircraft is shot down the battle plan could fall into enemy hands. Their point is well taken; however, the supporting aviators should at least be allowed to look at it to place in their own minds what is going on and the locations of all involved units. This could preclude the embarrassing situation described at the beginning of this article.

Back at the briefing we have found out that we will generally be employed with one fire team airborne at all times and the other

CPTs Swift and Herrick are serving in Vietnam.

The gunships kept the ground troops in sight at all times

on ground alert. This also allowed, of course, for rearming and refueling.

After tactfully refusing a second on the coffee and attempting to depart the briefing room for our trusty steed we found ourselves face to face with a Vietnamese lieutenant carrying a good old PRC-10. This, we were told, was of the school-trained type of observer who would fly with each fire team leader. Not only this but he loved to fly, knew the area like the back of his hand, and would be able to be in contact with all the ARVN company commanders on the ground. By Jove!

This young man, with a map of his own in front of him, would have to OK each strike. Since some portions of the area were heavily forested, this became quite a necessity. Of course, there was a language problem in some cases, but a visual thumbs up or thumbs down signal coupled with his markings on his map always put us in the ball park in time for the first pitch. Smashing!

Knowing the area was controlled by two VC 500-man battalions, extreme care and coordination would have to be exercised between the ground troops and the gunships to ensure the safety of the 600-man friendly task force.

The move by the third battalion from Tan Uyen was handled without incident, with the gunships providing recon and flank security. Reconnaissance by fire was used on call by both the American advisor and ARVN commanders during the march. Flying constant and close cover, the ground forces were kept in sight at all times during the move, allowing for close recon by fire to their positions.

Next morning the task force jumped off at 0800. The gunships were held back to avoid giving the enemy advanced warning of a big operation in progress. Sometimes this will tend to anger a gunship platoon leader because he thinks he is not being used properly and should in effect be somewhere else where he can be more fully appreciated. However, if he would give a little more thought to the problem, he would see the ground commander's idea behind his actions.

In this operation the plan bore fruit. When the gunships were employed they immediately spotted a VC "armed cavalry squadron," buffalo pulled oxcarts moving toward the Binh Dong province area. After permission was received to take them under fire, several were destroyed. One who escaped into a tree line was re-

The gunship commander called in his ally—the artillery—on the VC

turning fire with a pedestal mounted machinegun.

The same technique was used to cut down approximately 100 VC moving in low scrub away from the friendly troops. You're going to say that by the time you receive permission they will be gone; not true. Remember the lieutenant in the back? He's got contact with the friendlies on his radio and immediately knows where the friendlies are and gives you the old thumbs up signal to kill. He's back there "a-looking," not turning green and reaching for his helmet.

Finding out that there were still VC left to fight, the gunship commander then called in his standby ally, the artillery. While the artillery was falling, he also oriented an USAF forward air controller to the situation and departed for refueling. As four USAF A-1H Skyraiders hit the target, the remaining fire team on station didn't just fly around and cool it while talking about the floor show at the Moulin Rouge the night before. They stayed observant and as close to the area as possible without getting in the way of the boys in blue.

It immediately brought results. One of the door gunners, also observing, spotted a rifle grenade being fired from another area. The regimental commander altered his attack plan to take this objective. The results were three VC killed in action, five captured, 220,000 pounds of rice, and assorted mines, ammunitions, mortar shells, etc. My, but it's amazing what can be accomplished when all elements work together.

The last day's plan was for the third battalion to become a blocking force as the first battalion swept towards them to catch elements of the VC D800 Battalion. Success became readily apparent as the VC tried to cross an open area within 500 meters of the friendly troops, one by one. The ground troops immediately marked the limits of their positions with smoke, gave a range and azimuth to the target, and directed the strike.

Artillery support was again called in, but before it could fall a transmission was received, "Don't shoot; we are friendlies." A cease fire was called temporarily to check for a mistake in position marking, but it became quickly apparent that the VC had cracked the radio net. Fifty bodies were counted on the ground.

Flank security and recon was provided to the third battalion on its march from the operational area back to Tan Uyen. Some VC sightings were made in a safe passage without ambush.

There are many aspects of the above operation that individual commanders would not use for various personal tactical reasons. That has to be, but generally with both sides willingly working together as a team, it makes not only for a better operation but for a little less sweat and tears as well. True some of us and some of the ground commanders won't listen, but we can be like Snoopy and try again.

After the doorgunner spotted the VC, the regimental commander altered his plan of attack

Frozzleforth bubbled with
enthusiasm over his
latest assignment . . .
he had thrown himself completely
into his new role.

the following 28 pages prepared by the United States Army Board for Aviation Accident Research

CHARGE!

. . . the hell-bent-for-leather of the old horse cavalry combined with the daring individualism of the World War I ace that Frozzleforth, the world's greatest aviator, had always tried to emulate

Major Lawrence F. Beyer

GAD, WHAT A magnificent way to fight a war, thought CPT Horatio Z. Frozzleforth, the world's self-acknowledged greatest aviator. These aviation troops in cav squadrons are the greatest thing to happen to the U. S. Army since they put the last horses out to pasture. The glory of *Boots and Saddles* and *Cavalry Charge* is with us yet!

Frozzleforth bubbled with enthusiasm over his latest assignment as section leader of a light scout section of Troop D, 1st Squadron, 18th Cavalry. Here was the hell-bent-for-leather of the old horse cavalry combined with the daring individualism of the World War I ace that Frozzleforth had always tried to emulate. He had thrown himself completely into his new role. He had removed his own branch insignia, replacing them with crossed sabers obtained on a short trip to An Khe. His issue .38 sported imitation bone grips from a shop in Pleiku and was worn high on his right hip, butt forward, in a civil war style holster. He disdained jungle boots, favoring instead a pair of tankers' boots, complete with short spurs, for which he had paid an outrageous number of "p's" in Saigon. The most recent addition to his image was a drooping unkempt mustache, perpetually stained with tobacco juice from the plug of Prince Albert which had become a permanent bulge in his left cheek. Several of the young warrant officers of the troop ir-

reverently suggested on one occasion that he should spray-paint himself blue to complete the picture.

This morning, Frozzleforth was not nearly as enthusiastic as he usually was. It was his turn to fly the dawn sweep of highway 17 between the city of Pleibong and the Gan Bang pass. And at 0430 it was rather hard for Frozzleforth to be enthusiastic about anything, even the U. S. Cavalry. He resented having to interrupt his rest just to make sure that the road was clear so that the M-48s and ACAV's (armored cavalry vehicle) of the rest of the squadron could move out to their positions. You'd think the soldiers could do a little something on their own, especially at these uncivilized hours, he grumbled.

He continued to mutter dark things as he groped about the dark tent for his clothes and gear. Frozzleforth's humor was not improved by the cold water shave from his steel helmet, nor the cold drizzle that greeted him as he trudged toward the mess hall for a quick bite of breakfast.

"Good morning, sir."

It was Warrant Officer Fuzz, Frozzleforth's wing man. The world's greatest aviator muttered a reply. It seemed that these warrants from Fort Rucker were getting younger every day. Take Fuzz for instance. He couldn't be more than 19 or 20. Not a bad sort though, mused Frozzleforth. He wasn't the brightest lad to ever come down the pike, and certainly he didn't even come close to having the flying ability that new pilots in Frozzleforth's younger days had. Why he remembered back in the days at Fort Sill when he'd had to take an L-5 and . . .

"The weather doesn't look too good this morning, does it sir?"

"Huh? Oh, no sweat, Fuzz." Frozzleforth was jolted out of his reverie. "You youngsters might let a little rain and fog stop you. But those of us who've been around for a while know the MISSION is the important thing. You can't fly all of your sorties on a CAVU day. Why I remember flying the border in Germany on days when the weather was so bad that you couldn't even see . . ."

"Sir, if you'll excuse me, I've got to get started on my preflight."

"What? Oh, fine. Yeah. We pull pitch at 0515."

"Did you get the artillery call signs and frequencies from ops, sir?"

"Fuzz, adjusting artillery is not the job of the cav. That's for those cannon cockers in divarty."

the thought that an OH-23 isn't equipped with sufficient flight instruments for IFR flight never entered the great one's head as he pressed on into the murk . . .

Fuzz, properly rebuked, beat a hasty retreat.

Frozzleforth sipped the last of his coffee and thought ahead to the upcoming mission. His spirits began to rise. The very thought of riding forth on his trusty steed to battle was enough to wipe the gloom of predawn away. He looked at his watch. It was 0500. He decided he'd better get a move on.

There was no time to preflight, but no matter. SP5 Nagurski, the crewchief, also flew as his observer and, as everyone knows, if a crewchief has to fly, his machine is always in good shape. The OH-23G was ready when he arrived. The blade was untied and Nagurski was waiting.

"Morning, Nagurski. Is she ready to fly?" asked Frozzleforth as he unbuckled his pistol belt and dropped it gently into the right side of the bubble.

"Yes sir. I just finished the daily."

"Well, let's get this show on the road."

Frozzleforth rolled up his sleeves, knowing it would be a scorcher as soon as the sun came up. He pulled on his long yellow Navy flying gloves. Normally he didn't bother with gloves but these yellow ones just dripped with the look of the horse cavalry and, since he had started wearing them some months ago, he'd noticed that they weren't nearly as unhandy as he had always maintained.

"Clear!"

The engine sputtered, then grudgingly roared to life. A quick mag check later and Frozzleforth was hovering across the airfield to the takeoff pad with WO Fuzz right behind. Moments later they were airborne in the half light of almost dawn. The weather was, to say the least, marginal. Visibility was about a quarter of a mile in fog and dropped to less than that in the rain.

"Shamrock 21, just keep tucked in nice and close. We'll run this recon and be back at the south forty for coffee before you know it."

"Roger, lead," replied Fuzz. "What about this weather? It looks pretty skosh!"

"Don't give it another thought. Just stick close to your old dad."

Almost before he realized it, they were upon highway 17 and Frozzleforth yanked the Hiller around in a tight right turn so as not to lose the road in the murk.

"Have a heart, lead. I'm having trouble enough staying with you without the steep turns."

In his day, Frozzleforth mused, they taught formation flying in school. It was a real pity the way they were turning out these half-trained kids and calling them aviators these days.

The weather, rather than improve, began to deteriorate. Forward visibility was something less than a quarter of a mile and the ragged indefinite ceiling hung just above the tops of the trees. Lower and lower flew the intrepid aviator. There was no problem over open country. But when trees forced Frozzleforth to climb even 50 feet, the wisps of clouds enshrouded his bubble and for as much as several seconds he was completely IFR.

But a little weather never had troubled Frozzleforth in the past and he wasn't about to let it trouble him now. Besides, he had a brand new pink tactical instrument ticket in his wallet which said he was qualified to fly under instrument conditions in a tactical area. The knowledge that this magic piece of paper was nestled close to his derriére in his hip pocket was most reassuring. The thought that an OH-23 isn't equipped with sufficient flight instruments for IFR flight never entered the great one's head as he pressed on into the murk.

Nagurski had long since given up attempting to scout the sides of the road, which were lost in the mists more than 75 percent of the time. Instead, he concentrated his attention on the road directly ahead and below them. He also prayed a lot. It was raining intermittently now and the rain on the front of the bubble reduced the forward visibility to absolute zero, even out of the clouds. Nagurski strained his eyes to see ahead.

Suddenly, directly ahead of the Hiller loomed an FM radio antenna.

"Look out!"

Unfortunately, in his haste to sound the warning, Nagurski failed to push the interphone button. But his shriek was loud enough to penetrate Frozzleforth's helmet without benefit of electronics. Just as his ears received Nagurski's cry of alarm, Frozzleforth's eyes perceived the impending disaster. In an attempt to climb over the antenna, he applied full aft cyclic and collective until the rpm began to drop off. But try as it would, the Raven couldn't climb fast enough. They almost made it, but the Hiller trademark slammed into the antenna just 6 feet from its top. The bubble shattered into a million razor sharp fragments of plexiglass and the '23 began to buck and vibrate.

Just before the impact, Frozzleforth had instinctively turned his face to the right, and, as his green helmet visor was up, this probably saved his eyesight. As it was, his left cheek was cut and blood oozed from many small painful cuts along his naked arms. Nagurski had not turned his face away from the shattered bubble but his clear visor, which had been fully down, had protected all but the lower one-third of his face.

Frozzleforth's only thoughts were to get the crippled Hiller on the ground soonest. He bottomed the pitch, forgetting, unfortunately, to roll off throttle. The rpm surged to 3700. Frozzleforth frantically rolled off throttle as he attempted to salvage and terminate his somewhat nonstandard autorotation. They hit the road with around 20 knots of ground speed and a bit harder than normal. In fact the landing was hard enough to bend the cross tubes so that the belly of the OH-23 scraped the roadway.

"Shamrock 21, this is 20. I hit an antenna and am down on the road."

"Roger, lead. This is 21. I've got you in sight and am orbiting. I notified Shamrock Control of your situation and the wrecker is on the way."

Nagurski was out of the aircraft and pulling off the M-60s. Frozzleforth cut the mixture with disgust and sat dejectedly. Nothing to do but sit and wait to be picked up now, he thought. What rotten luck that this should happen to an aviator who was the very personification of professionalism. Such injustice.

"Shamrock 20, this is 21. There are about a dozen Viet Cong moving toward you from the north. They're about 300-400 meters away and it looks like they're carrying weapons."

Frozzleforth swung his head to the left as a

CHARGE!

flurry of small arms fire kicked up small chunks of dirt along the road shoulder. "Holy insurgency, Nagurski. Here comes Charlie!"

Nagurski, who was busily engaged in pulling out the last radio, didn't even pause. He scooped up the two machineguns, draped belts of ammo over his shoulder, and dee-deed off to the far ditch. Frozzleforth came out of the cockpit as if shot from a cannon, pausing only long enough to note ruefully that his .38 with its beautiful imitation bone grips had departed the aircraft at the same time as the bubble.

As Frozzleforth sprinted for the ditch, he heard the chatter of Fuzz's machineguns. Good old Fuzz. Always did like that boy, thought H. Z. as he dived, head first, into the muddy ditch beside Nagurski, who was busily replacing a firing solenoid with a trigger housing group on one of the M-60s.

"Where'd you get that, Ski?"

"I traded off a poncho liner for it last month at Bong Son. Thought it might come in handy and I've carried it ever since, sir."

"Hey, gimme your M-16. I lost my .38 when we hit that antenna."

Fuzz was rolling into his second firing pass now but the little black clad figures were still moving down the slope toward their position. Again Fuzz opened fire and the VC squad was momentarily pinned down. As Fuzz broke off his second firing run, Nagurski opened fire with his hand-held M-60. His fire wasn't accurate but it gave the Charlies

something to think about and their advance, though steady, was slowed appreciably.

Fuzz was only firing with one gun now and the VC had closed to 200 meters. Suddenly in the middle of one firing pass, Fuzz broke off and moved clear.

"Don't leave us now you cowardly little adolescent," hollered Frozzleforth at the retreating Hiller. But his yell was punctuated by the crump of an exploding artillery round landing 100 meters beyond and 100 meters right of the advancing VC.

"Sir, I believe Mr. Fuzz has called in artillery on them."

"I do believe you're right, Nagurski. Things are starting to look up."

Now Frozzleforth was grateful that Fuzz had copied the frequencies and call signs of the local artillery unit from the board at operations. Good old Fuzz, thought Frozzleforth warmly. Fuzz continued making firing passes between each incoming round of artillery, although both of his machineguns had been silent, either due to jamming or lack of ammunition, on the last two passes. But each time he rolled inbound the VC took cover and slowed their advance.

Now the tubes were firing for effect. In the distance, Frozzleforth heard the beat of rotor blades as other elements of D Troop came to their rescue. The overcast had risen to 100 feet as two of the most beautiful gunships that our intrepid hero had ever seen flashed overhead, spewing rockets, machinegun fire and 40 mike-mike into the VC. As the lead C model rolled in on its second pass, two slicks settled into the rice paddy directly behind Frozzle-

forth and began unloading two squads of infantry from the troop's rifle platoon. One squad thundered into the ditch and established a base of fire, as the second maneuvered to close with the now withdrawing guerillas.

But our hero wasn't staying around to watch the action. He was moving out smartly toward the slicks with Nagurski, lugging machineguns and radios, close at his heels. Moments later they were airborne and speeding back to the safety of the division base camp.

"Frozzleforth, you are unbelievable. Not only do you wreck an OH-23, lose a pistol, and demolish an ARVN radio antenna, but you have the audacity to stand there and tell me that you think you ought to get medals for it." Major Yossarian, D Troop's commander, had not taken kindly to the world's greatest aviator's suggestion.

"But sir, we did flush out a VC squad, which is more than my section has found since it arrived in-country. And I've never really considered the ARVN to be friendly, so the wounds caused by their antenna should really be classified as due to hostile action."

"You're out of your mind! You really are. I ought to send you off to the funny farm," said Major Yossarian softly. "A DFC for Fuzz is certainly in order. His actions, competence, and courage are the reasons that you're standing here now. You can thank your lucky stars that he was trained as well as he was because that training saved your tail. But a medal for you? I'd sooner sleep with a tiger!

"Captain, are you aware that we are losing twice as many aircraft to accidents as we are to enemy action throughout Vietnam? Every airplane we lose, every pilot who is injured or killed in an accident, doesn't contribute one whit to the winning of this stinking war. Your overzealousness in attempting to accomplish a mission which your good judgment should have told you was beyond your capabilities has cost me 12 percent of my scouting capability and did not accomplish a single thing. You'll be interested to know that I sent a second scout team to recon the road after we extricated you and they discovered an ambush which you completely missed on your sweep because of the marginal weather. Haven't you learned anything in your years as an aviator?

"Last week I discovered a levy to supply an officer for a new organization that they are forming up at Da Nang. It is an armed UH-19 company which will operate closely with the Marines in and around the DMZ. It is a composite outfit to be commanded by a Department of the Army civilian and it should be a very interesting assignment for some lucky officer. Frozzleforth, are you aware that your form 759 indicates that you have several hundred hours of UH-19 time?"

"Sir?"

"Goodbye, Frozzleforth."

Author's note:

Shortly after his arrival at Da Nang, CPT Horatio Z. Frozzleforth was medically evacuated to the United States due to a severe case of hemorrhoids. Members of his old unit, the 1/18th Cav, heard rumors that, due to someone at DA inadvertently stepping on his IBM card while wearing golf shoes, Frozzleforth was subsequently promoted to major and assigned to Fort Rucker where he is now writing syllabi of instruction, standardization memos, and employment manuals. I don't know if the rumor is true. But, strangely enough, DA reports a flood of 1049s from Fort Rucker requesting reassignment to Vietnam.

AUTOROTATIONS-

CAUSE & EFFECT

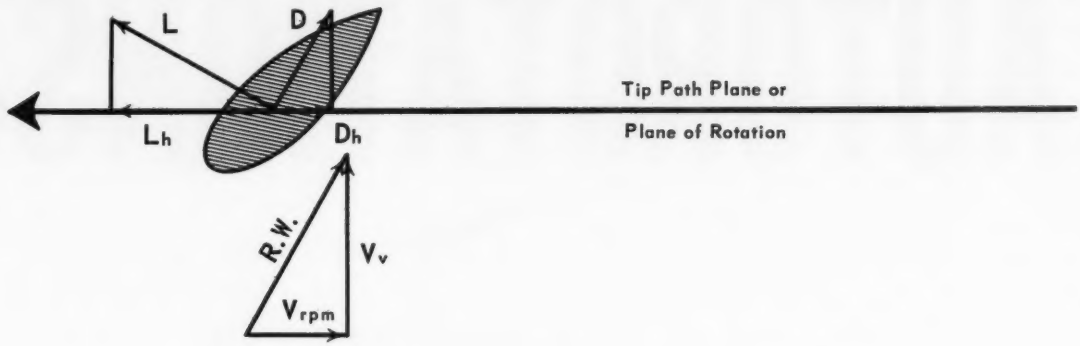
. . . the modern military pilot,
with so many demands
on his time, may find it
easy to rely on rather superficial
aids to understand
his aircraft and its reaction

H. E. Roland, Jr.

ALL TOO OFTEN near misses and accidents involve practice autorotations. The balance of forces acting in the autorotation maneuver is not commonly understood in its entirety. However, the interaction of forces and helicopter reaction is not too complex and can be reviewed in a fairly simple manner. A total understanding of the forces acting is the first step towards performing a predictable, well controlled maneuver. Such a maneuver is, almost by definition, a safe maneuver.

Autorotation is the method by which the pilot lowers the powerless helicopter through the atmosphere at a reasonable rate of descent, using the energy of gravity to maintain main rotor rpm and, through it, tail rotor rpm and control. During this

AUTOROTATIONS



V_v - the vertical rate of descent or vertical velocity of this airfoil.
V_{rpm} - the velocity of the airfoil in the plane of rotation caused by the rpm.
R.W. - the relative wind which is felt by the airfoil due to the descent and rpm.
L - the lift of the airfoil which always acts perpendicular to the relative wind.
D - the drag on the airfoil which always acts parallel to the relative wind.
L_h - the horizontal component of lift acting in the plane of rotation.
D_h - the horizontal component of drag acting in the plane of rotation.

FIGURE 1

descent, a certain portion of this energy is stored in the main rotor where it may be called upon to further decrease the rate of descent at the proper moment, just before touchdown.

It might be well to first examine the establishment of rotor rpm. The action of a windmill is well known and the rotation of the rotor is not surprising. If the rotor is orientated at a sufficiently large negative angle of attack, it will be immediately assumed that it will rotate, replacing the torque which was imparted to it by the engine, with aerodynamic forces. Of interest to our fledgling pilot is selection of the proper rpm for maximum resistance to the passing of the rotor and the forces which maintain this rpm. Figure 1 illustrates the simple windmilling airfoil and the forces which maintain its rpm.

It can be seen in figure 1 that L_h is greater than D_h and, therefore, the airfoil will accelerate or the rpm will increase. As this occurs, the direction and magnitude of the relative wind will change. In turn, this will alter the magnitude of both lift and drag. As the rpm continues to increase, L_h will decrease and D_h increase until they are equal. At this particular rpm, the airfoil will be in equilibrium and the rpm will remain constant. If the angle at which the airfoil is set could be altered, the equilibrium could be established to any desired rpm within reason.

Within the total helicopter rotor, the situation is similar to this simplified picture, but somewhat more complex. A blade angle setting will be selected with the collective which will give a desired rpm and, with this rpm, the greatest resistance to the passage of the rotor in its descent, consistent with the desired energy to be stored for the flare for landing. The resistance or lift generated by the powerless rotor can be amazingly large – approximately equal to that of a parachute of the same diameter.

However, in the real rotor, the V_{rpm} varies along the radius of the blade, while the vertical velocity remains constant. This means that the relative wind is constantly changing along the radius of the rotor blade. If the entire rotor disc is examined, it can be easily divided into three general regions. A small region in the center of the disc is stalled. In this region the angle of the relative wind with

respect to the blade is quite large. This is caused by the very small V_{rpm} at the short radius. Outside the stall region is found the autorotation region. In this region L_h is greater than D_h. The autorotation region then is providing a net force to accelerate the rotor.

Near the circumference of the rotor disc is found the propeller region. In this region the V_{rpm} is quite high due to the large radius. The distinguishing feature of this region is that the D_h is greater than L_h so that this region contributes a net force to decelerate the rotor. These regions, their typical airfoil sections, and the accompanying aerodynamic forces are shown in figure 2.

Figure 2 represents a condition of vertical autorotation. The stall and autorotation regions will be displaced slightly during autorotation at some forward speed.

Once the pilot selects a blade angle with the collective, the propeller and autorotation regions

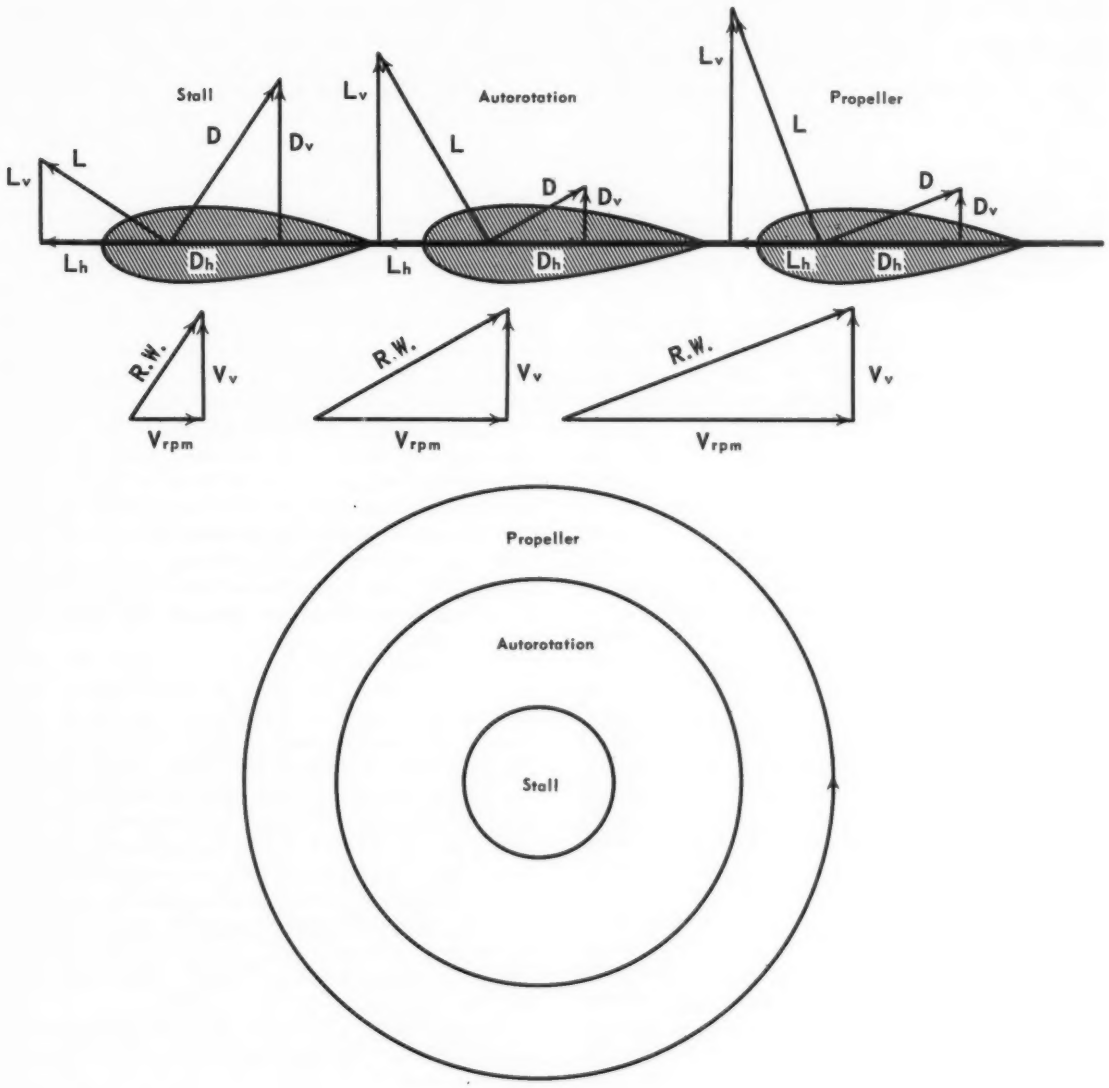


FIGURE 2

AUTOROTATIONS

. . . a lot of bar talk is heard concerning the forward speeds of autorotation. The high rate of descent in vertical autorotations is well known, but what is it that causes this?

are established in such a way that their respective unbalance of forces are balanced against each other and the rpm of the rotor stabilizes. If the collective remains set at this position, the rpm will always return to the same value, even if momentarily increased or decreased by gusts.

The lift of the rotor is represented by the vertical values of lift and drag down as L_v and D_v. It can be seen that all regions of the helicopter rotor disc furnish lift, but the propeller region contributes the majority of the lift.

Fortunately, the pilot does not need to experiment with the collective to find the optimum setting to minimize the rate of descent. The manufacturer specifies the optimum rpm for autorotation and it is only necessary for the pilot to select this rpm by balancing forces in the rotor disc with the collective position.

It might be well to examine for a moment the danger inherent in the establishment of the correct rpm at the time of power loss. When power is lost to the rotor, the collective will be up and the angle of all blades will be high. This will tend to make the majority of the rotor disc become a propeller region. The aerodynamic forces cannot be balanced under such conditions and the rpm will steadily and quickly decay. If the rpm decreases to a very low value before the pilot takes action, lowering the collective will not provide the forces necessary to accelerate the rpm. The V_{rpm} will have decreased to such a low value that the angle of the relative wind will remain high throughout the disc and the rpm will continue to decay. Recovery may be effected prior to loss of control if forward speed is increased by diving. In this case altitude must be sacrificed.

A lot of bar talk is heard concerning the forward speeds of autorotation. The high rate of descent in vertical autorotations is well known, but what is it that causes this? The engine imparts torque to the rotor and the torque, combined with the rpm of the rotor, can be computed as horsepower. A simple plot of the horsepower needed to drive the rotor at its autorotation rpm at all forward speeds may be made. Figure 3 shows a typical plot. It can be seen that more horsepower is required to autorotate at zero knots forward speed than at moderate forward speeds. As the speed continues to increase, the power reaches a low point and then begins to increase, eventually reaching a value which is greater than that of zero forward velocity.

During autorotation, such power as is available is furnished by gravity. As the force of gravity remains constant on the helicopter of constant weight, the power furnished by gravity will be constant. Therefore, the lack of horsepower, which may be converted to rate of descent at any given forward speed, will be less at some moderate forward speed than at zero forward speed. If rate of descent versus forward speed is plotted, the shape of the curve will be very similar to the horsepower figure.

Thus it can be seen that the minimum rate of descent will occur at a moderate forward speed. The speeds implied in figures 3 and 4 are true airspeeds. If the autorotation is being made against a headwind, it would be possible to descend vertically over a point on the ground, with a rate of descent less than that indicated for vertical descent. A tailwind would have an opposite and more dangerous effect.

Operational considerations may cause the pilot to choose one of two types of autorotations, that for minimum rate of descent, or one which will provide the most distance covered over the ground for each foot of altitude available at the start of the autorotation. This is normally called the best glide performance. The rate of descent curve provides the key to each of these. As can be seen in figure 5, the low point of the curve is obviously the speed at which to maintain the minimum rate of descent. But what of the best glide speed? It must be some combination of slightly higher forward flight speed and rate of descent which does not sacrifice too much rate of descent.

Figure 5 shows that a line drawn from the origin of the plot and just touching the curve will indicate the best speed to glide for maximum distance covered during the autorotation. The triangle thus

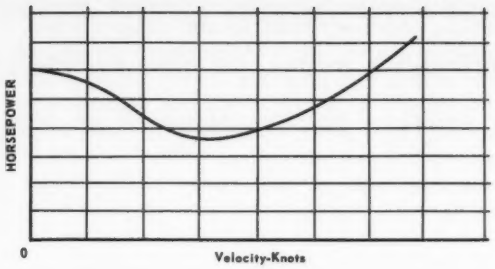


FIGURE 3

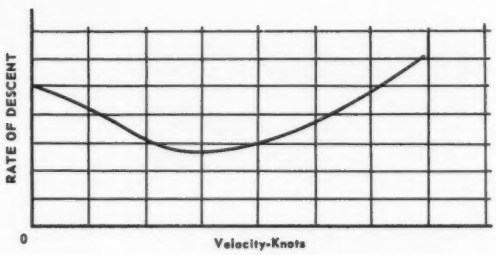


FIGURE 4

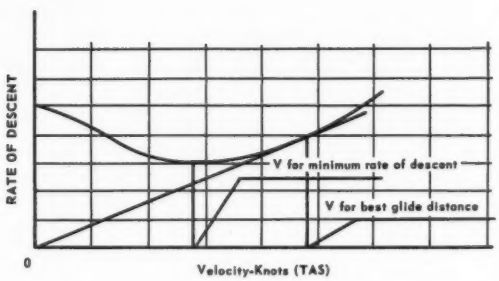


FIGURE 5

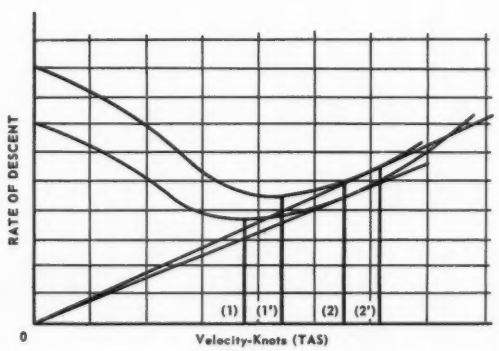


FIGURE 6

formed will establish the maximum velocity per rate of descent. A slower or faster velocity will decrease the ratio between the two quantities and decrease the distance glided from a given altitude.

The pilots' handbook will give the above speeds for the basic weight and standard density conditions. But what if conditions are nonstandard? In general, if the density altitude or gross weight is increased, the drag on the rotor blades is increased in such a way that the horsepower and, thus, the rate of descent will be increased. Furthermore, the character of the curve will be altered slightly in that the points of interest will be moved to the right. Figure 6 illustrates this point.

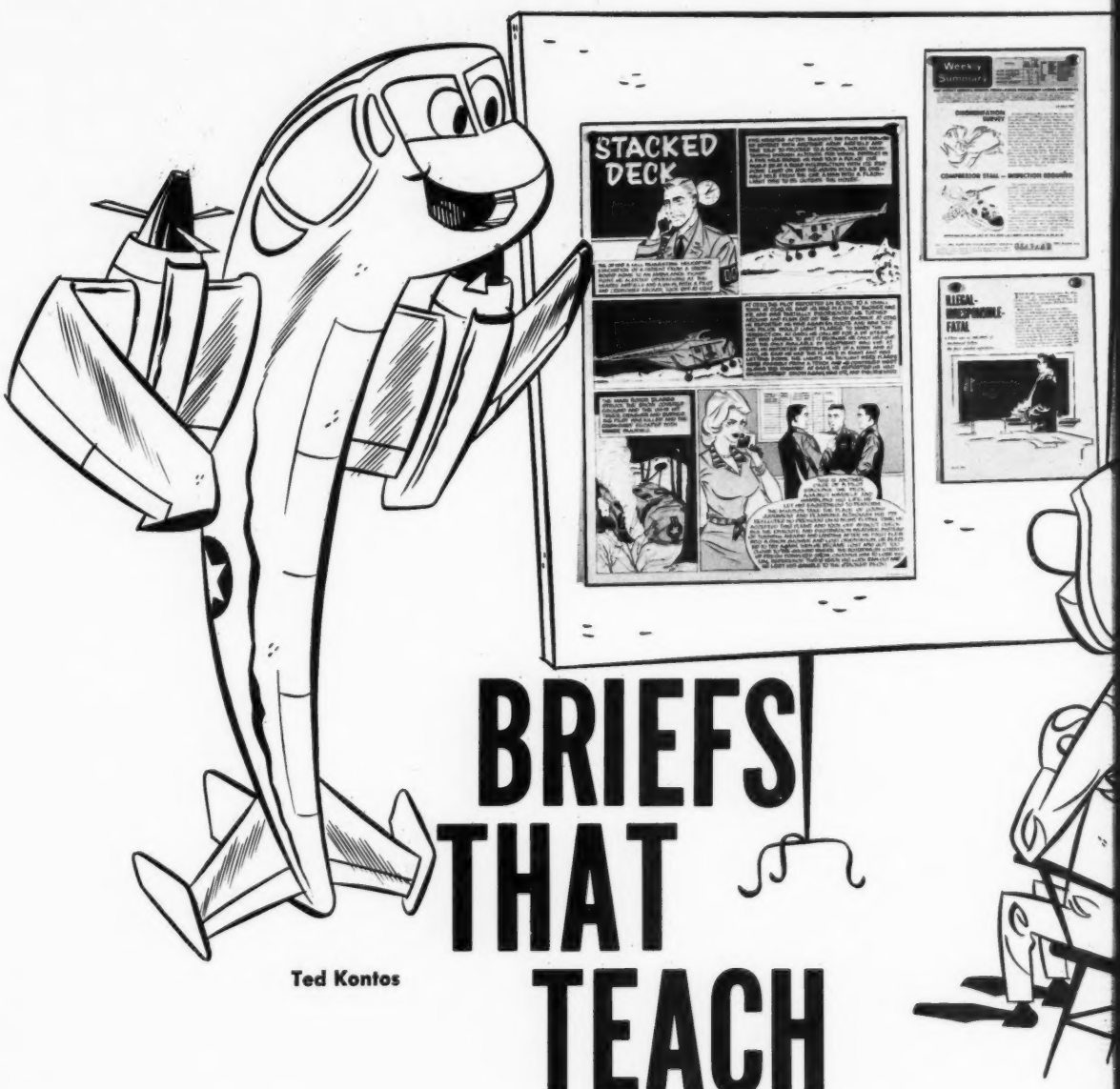
Velocities at (1) and (1′) represent the increase in speed for minimum rate of descent, caused by the increase in gross weight or density altitude. Velocities (2) and (2′) represent the increase in speed for best glide performance at the higher weights or altitudes. If a pilot does not have the handbook figures in mind, he will know that a small increase in the basic speeds will place him close to optimum performance.

Execution of a safe landing from the autorotation descent will depend on the pilot's skill and judgment in recovering the energy stored in the rotor. The energy stored in the rotor is dependent upon the rpm and moment of inertia of the rotor. The higher the rpm, the greater the energy which will be available when the collective is raised. This moment of inertia may be compared to the swing weight of a golf club. A weight near the head will cause the club to swing heavy. A similar weight added near the handle will not make the same addition to the swing weight.

For this reason, helicopter rotors with long blades will tend to have better autorotation characteristics than short bladed rotors. Also, helicopters with light blades will have poor characteristics. However, this is only a generalization and other factors, such as rpm, can modify these conclusions. The modern helicopter is moving toward short heavy blades rotating at high rpm which, in sum, improves autorotation characteristics.

The modern military pilot, with so many demands on his time, may find it very easy to rely on rather superficial aids to understanding his aircraft and its reaction. Pilots' handbooks and simplified training manuals, as well as a fundamental knowledge of the forces of nature acting within the aircraft, are all necessary. The pilot who masters the simple engineering principles of his aircraft—who understands the *why* behind the reaction—immediately elevates himself to a new level of competence and safety.

. . . in our continuous search for more effective accident prevention means, we have overlooked safe flight briefs, a positive approach to safety



BRIEFS THAT TEACH

Ted Kontos

TO PROMOTE AVIATION safety, a variety of aids are used. Among them are safety posters, articles, and accident briefs. Each has merit. Safety posters warn of hazards and advertise correct procedures. Articles provide a source of valuable information and accident briefs publicize causes and results, so that aviation personnel may profit from the experience of others. But in our continuous search for more effective accident prevention means, we have overlooked a special kind of *brief* which provides information that is simple to understand, easy to use, and probably more effective in promoting safety than the combination of all the above. Despite its availability, it is seldom used. Following is a typical example:

A U-6A pilot was to deliver airplane repair parts to an unfamiliar airport approximately 150 miles away. He was assigned a copilot and given a sectional chart showing his destination. Takeoff was at 1402 hours and the flight proceeded on schedule. On arrival over his destination airport, the pilot made a high and low pass over the field, then established his approach for a landing to the east. At 1535 hours the Beaver touched down on the runway, and approximately three minutes later was parked and the engine shut down.

That's it. No morbidity, no thrills, no accident investigation board needed — just another routine flight *safely* completed. But don't go away. Dull as it may be, this brief — and the hundreds like it that could be written daily — hide a wealth of information. This flight did not end safely by accident. An analysis would show that the pilot selected was qualified, rested, in good health, and emotionally stable. He was well briefed, thorough in his planning and performance of inspections, operational checks, etc., and he adhered to applicable regulations and SOPs. In short, from start to finish, he conducted himself in a thoroughly professional manner.

In contrast, problems pop up and accidents result when flights deviate from prescribed procedures. Failure to assign qualified pilots to suit mission requirements, for example, can be counted on to produce accidents. It doesn't matter whether or not a pilot is a recent graduate, a veteran aviator inexperienced in the type aircraft assigned, or qualified in the type aircraft to be flown, but inexperienced with regard to the operational environment.

A helicopter pilot lost rotor rpm while hovering over rough terrain at a high altitude and settled. He attempted to bounce his wheels off the ground to regain lost rpm and the right front gear caught on a rock projection, rolling the helicopter on its side. The cause? An inexperienced pilot was assigned a mission beyond his capability.

A UH-1 pilot lost visual reference with the ground in weather and the helicopter crashed during a night ferry mission. The pilot was not instrument qualified and had not been given any instrument flight training for two years.

Another UH-1 pilot crashed into trees during an attempt to move his helicopter through dense fog from one heliport to another. The helicopter burned and the pilot and his crewchief were killed. This *noninstrument* rated pilot attempted flight with zero ceiling, totally obscured sky, and 1/16 mile visibility in fog.

A UH-1 helicopter disintegrated at approximately 600 feet during a test flight, crashed, and burned. The pilot did not recognize engine failure in time to prevent excessive decay of rotor rpm. Severe

resonance of the main rotor mast and transmission resulted, and the main rotor severed the tail boom. The main rotor and transmission disintegrated, rupturing fuel cells and causing an inflight fire. Although the engine failure was caused by fuel starvation due to an improperly seated fuel quick disconnect coupling, the test pilot was inexperienced, had received no formal training in aircraft maintenance or procedures involved in test flights, and was not on test pilot orders.

Although it is difficult to accurately establish the number of accidents due to pilot fatigue or other physical or emotional disorders, evidence indicates that these factors are involved more often than investigations show. Pilot fatigue due to insufficient rest between flight assignments resulted in the crash of a twin engine airplane during an IFR flight. The pilot was qualified, experienced, and highly skilled. Had he not been fatigued, he could have coped with the weather. Similarly, when the engine of an O-1 failed over open and level terrain, under conditions which should have resulted in a successful forced landing, the pilot, plagued with marital problems, could not cope with the situation and crashed.

The value of complete preflight briefings was demonstrated approximately 19 years ago when 16 airplanes were ferried to a large mountainous island in the Pacific. Although many prepared landing fields were available, the pilots were briefed on only *one*. When they arrived over the island, the weather socked in and they lost contact with the ground and each other. Breaking formation, the pilots hunted for openings as their fuel supply was depleted.

As fast as they could find holes, eight pilots crash landed on the coral beaches. Four pilots miraculously came upon another airfield and landed safely. The remaining four were not as lucky. They plowed into a mountain. Four aircraft were destroyed, eight aircraft were severely damaged, three pilots were killed, one pilot was seriously injured, and air-sea rescue was busy for three days. Although other factors contributed to these accidents, *a preflight briefing on alternate airfields could have prevented them.*

Incomplete planning is another cause of accidents. A helicopter settled with power at a high density altitude and crashed on a mountain during a drop mission. It was over maximum allowable gross weight by 450 pounds for the density altitude of 7,940 feet. *The pilot did not compute his gross weight before the flight and thought the helicopter was approximately 700 pounds lighter than it was.*

Another accident resulted when a UH-1 engine failed and the helicopter was autorotated to a hard landing. Although the hard landing was due to lack of autorotation proficiency, *the engine failure was caused by fuel exhaustion due to inadequate fuel management.*

Failure to perform preflight inspections has caused many accidents. Most notable are those resulting from loose quick disconnect couplings, crossed hydraulic servo lines, and contaminated fuel.

Violations of regulations and SOPs continue to produce accidents. For example, 93 percent of wire strikes resulting in major accidents occurred below 100 feet. In most instances, low-level flight was not dictated by mission requirements and was conducted in violation of unit SOPs.

It would take volumes to describe all the accidents and other mishaps which have resulted from failure to fly in a professional manner. It would take more volumes to point out all of the cause factors involved. This is where *safe flight* briefs can play an important role in the accident prevention program. A simple, "Flight was conducted at 200 feet and no wires were struck," tells more than a long list of wire strike accidents. An analysis of successfully completed flights can more effectively emphasize the value of preflight inspections, complete planning, adherence to regulations, etc., than all the volumes of mishaps resulting from inadequacies in these areas.

Because a flight did not terminate in a mishap does not necessarily mean it was accomplished without incident or compromise. Did the pilot experience a near miss? If so, why? Was it due to inattentiveness? Trying to fly VFR in IFR weather? Did an engine falter because of fuel mismanagement or because carburetor ice was permitted to build up. Did the pilot jeopardize his safety and that of his passengers and aircraft by deviating from his planned route? Did he fly over terrain unsuitable for a forced or precautionary landing?

Analyses of safe flight briefs provide answers to such questions quickly and clearly. It is a positive and effective approach to safety. Where do we find such briefs? Who would bother to read them if they were published? That's the best part. They don't need to be written or read, yet are accessible to every aviator. They are as close to you as your most recent flight, or the flight before that, or the one before that. . . . It is only necessary for you to make an honest appraisal of yourself and your actions—*and learn from your own experience.*

pearls personal equipment and rescue/survival lowdown

WITCHERY OR INGENUITY?

TELEVISION AND TALES of hobgoblins to the contrary, neither magic nor the best equipment to be had will ever exceed the value of ingenuity and inventiveness when it comes to rescue/survival situations. Our lead item this month is about an aircrewman who signaled a search pilot with, of all things, an air-sick bag! He was an observer in an O-1D during a reconnaissance mission. Here is his story:

". . . At that time, I looked around and the plane started hitting trees. All I could see was trees until we hit solid. I then opened my eyes and the first thing I saw was the engine along the right side of the plane. My head and shoulders were over the right side of the plane also.

"I pushed back into the seat and the flames were all around me. I unfastened my seat belt. . . .

If you have a question about personal equipment or rescue and survival gear, write to

Pearl

U. S. Army Board for Aviation Accident Research

Fort Rucker, Alabama 36360

By this time, I realized I could not move my right leg. It was bent at a right angle with the knee and hip. There was no top over me and no window on the right side. . . .

"I pulled myself over the right side down on the engine to the ground and crawled along approximately 25 yards to a trail. I looked back at the plane and it was completely in flames, with a big whoosh sound and explosion. I then crawled along a trail with some benches and sleeping platforms along it. I made a quick movement with my body and my leg went back in place. I got up and walked down a dry stream bed until I came out in a small opening where a big tree had fallen. I sat down and looked at my watch and it was 1030. I looked for something to signal with and found an airsick bag in the pocket of the flak vest that I was wearing. I ripped it open and used it to signal a helicopter and an O-1, but the pilots didn't see me. A few minutes later, I heard another Bird Dog and helicopter coming closer by and started flashing the airsick bag in the sun. The O-1 pilot spotted me and circled my position.

"A UH-1 helicopter came over and tried to land, but the trees were too tall. It came around again and dropped a rope which I tied around my hips and chest. I signaled and they pulled me up and flew to an LZ, then dropped me on the ground. The people there placed me on a stretcher and took me to the CP. . . ."

O-1D search pilot: ". . . I arrived in the area and began a systematic reconnaissance from the river to the west. After searching about 20 minutes, I spotted a man in a small jungle clearing waving something white. A low pass revealed him to be an American and I assumed it to be either the pilot of the crashed aircraft or his observer.

"I put out a Mayday and was answered almost immediately by a UH-1D pilot operating in the area. I gave him the location of the man and requested he proceed for a rescue attempt. . . . I directed the helicopter to the man on the ground, but he was unable to get down to the ground due to the trees. Crewmen in the UH-1 lowered a rope to the man on the ground. He tied it around him and they extracted and slung him to an LZ about two miles west, where they lowered him and found out that the pilot was still in the aircraft and it was located about 300 meters west of where we picked the man up. I returned to the area and located a small fire and what appeared to be a piece of plexiglass, but could not see the wreckage due to heavy foliage. . . ."

Unfortunately, the pilot of the downed O-1D was killed. But the observer, who survived the accident with superficial lacerations, first degree burns on his knee and thumb (from crawling over the engine during his exit), and a dislocated hip, put his ingenuity to work with what he had at hand and was able to signal for his rescue.

FLAK OR FLOTATION?

O-1E pilot (flying over bay): ". . . When I reached low level I brought the nose up, applied power, and started a gentle right turn. The engine began sputtering and I realized power was not being developed. I leveled the wings and lowered the nose as I worked the throttle several times. . . . I realized I was going to hit the water so I began a roundout. Due to the water surface being extremely smooth, the clarity of the water, and the bright sun, I hit the water before I expected to, without having the aircraft completely rounded out or slowed to stall speed. . . .

"The next thing I remember is being out of the aircraft and swimming, greatly aided by my flak vest. . . . I was in the water approximately 20 minutes before a fisherman came alongside and pulled me in his boat. I was then transferred to a Navy boat and brought to the hospital by helicopter. . . ."

Flight surgeon: ". . . The pilot was thrown from the aircraft with his helmet and vest intact. Momentary unconsciousness resulted and his vest kept him buoyant until he regained consciousness. He sustained multiple lacerations on his forehead, chin, arm, and foot. He also received a severe contusion of the lumbo-sacral area. . . ."

To test the buoyancy of the M-1952A Upper Torso Protective Fragmentation Body Armor (nylon flak vest), we had a life guard test it in a Fort Rucker swimming pool. This test proved that the nylon flak vest will indeed support a 165-pound man, with his neck and head out of the water. Just how long the vest will maintain its buoyancy is unknown, but it played a major role in saving the life of the O-1E pilot.

Dear Pearl:

Your idea of having a section of the magazine devoted to survival and survival equipment is one of the finest to come along in a long time. I subscribe to and read the U. S. ARMY AVIATION DIGEST. I go through it from cover to cover and derive a lot of value from its contents. I am a civilian, but one who thinks the populace should keep themselves better informed on information the military has to offer concerning survival, map reading, living off the land, and even escape and evasion.

This brings me to the point of this letter. In one of the copies of the DIGEST, between 1964 and 1965, there appeared an article about day and night directional navigation. . . . I would consider it a large favor if you could possibly nail down the year and month of this article. Many thanks and continued best wishes with your PEARL articles.

Albert A. Marty, Jr.
2661 Riverside Blvd.
Sacramento, California 95818

Dear Mr. Marty:

Thank you for your comments about the U. S. ARMY AVIATION DIGEST and our PEARL pages. The article you referred to is entitled "The Road From Nowhere," by SSG Stanley F. Guthrie. It appeared in the February 1965 issue of the DIGEST.

PEARL

Dear Pearl:

The June issue of AVIATION DIGEST contains several pictures of you in various stages of survival practice. I find no fault whatsoever with the photography and certainly none in you.

Being a survival instructor I do come in contact with all types of survival gear and personal equipment and as soon as I saw two of the pictures I felt that something just wasn't quite right. Further investigation showed that you were wearing your underarm life preserver harness backward. The patch that holds the straps should be located on the back and not on the chest as you are wearing it. The bladder cells, however, are as they should be. Can it be that the Army wears it in this manner for a specific purpose?

A number of Army personnel attend our course each year and it would be nice if we could acquire one of your new survival kits (the type you are demonstrating) to utilize in our training program.

Can you help?

SSgt Charles D. Cooke
Survival Training EWOTA
Wright-Patterson AFB, Ohio 45433

Dear Sgt Cooke:

You are absolutely correct and the patch holding the straps for my underarm life preserver harness was backwards. We discovered our error too late to correct it before publication.

Our Human Factors Branch is currently attempting to obtain one of the new survival kits you requested and we will send it on to you as soon as possible.

Many thanks for your letter and please let us hear from you again.

PEARL

FOG

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. . . the possession of a tactical instrument certificate caused the aircraft commander to have a great deal of overconfidence in his abilities as an instrument pilot

UH-1D AIRCRAFT COMMANDER: "We were called at 0230 by the staff duty officer who asked how long it would be before we could be airborne. I told him we could be airborne in 30 minutes, then woke up my pilot and crew. . . .

"We preflighted by flashlight and I told the crewchief and gunner to sit in the middle of the passenger compartment, just forward of the firewall, so they would not be cold. . . .

"We made a normal start and runup. At this time there was haze. We made no weather check, but we could look up and see the stars. We have used the weather facility when the weather seemed bad, but on this occasion we did not think it necessary, since we could see the light of the moon and stars, even though there was a haze layer near the ground. . . . I took off to the west and before I reached translational lift, I had the searchlight turned off because of the glare. . . . At this time, I went completely on instruments.

"Prior to takeoff, the possible need for me to be in the right seat for instrument monitoring did not occur to me. When I realized we had to go on instruments, I felt it was best for me to stay on the controls rather than switch controls to the pilot in the right seat.

"At the time I went on instruments, I still had a 40 knot attitude and had reached translational lift and begun a slight climb. I started a gradual right turn to clear the obstacles and I believe I was going through a heading of approximately 310°, at about a 15° bank, when we hit.

"I was not monitoring the rate of climb indicator, but going mainly by the attitude and airspeed. . . . At the moment of impact, I had no idea we were so near the ground since I was not monitoring the altimeter closely. I remember hearing a scraping sound when we hit and something hit my face. The next thing I recall is crawling out of the burning aircraft. I was not wearing the pistol, chest protector, helmet, or knife which I'd had on at takeoff.

"I realized I was alone so I went back and met the crewchief crawling out of my door (left pilot's door). I helped him out and away from the fire, then went back and saw the pilot in his seat. The seat was turned around, facing to the rear. He was pinned in the seat by the door post which had collapsed across him. He was not conscious. I pulled at him, but he was pinned in the wreckage and I could not get him free. I looked for the gunner, but could not see him. There were four of us aboard the aircraft. When I could not locate the gunner, I helped the crewchief to walk further away from the burning wreckage and we waited to be picked up by an evacuation helicopter."

"Were you aware that the weather forecasting service was available?"

"Yes."

"Was pilot weather service available?"

"Yes."

"Did you think to use this?"

"No."

"When you were at the helicopter pad prior to takeoff, did you see the fog rolling in?"

"No, it was already there."

"Were you aware of the fact that you would go on instruments?"

"No, not at first."

"Did you anticipate that you might have to go on instruments?"

"No, because I knew the local area and that fog existed in the area when it was usually clear elsewhere."

"What do you estimate to have been the horizontal visibility at the pad at the time of takeoff?"

"Approximately 50-75 meters."

"Have you ever read the company SOP?"

"No, I have never seen it."

"Have you received any guidance on weather minimums?'

"No, we have always used our own judgment."

"Did you ever receive a night checkout?"

"No, but I flew night time with other pilots."

"How much actual instrument time have you flown?"

FOG

50% of the burns sustained by the crewchief could have been avoided or considerably reduced had he worn gloves and had his sleeves rolled down . . .

"None logged. We have gone AI a couple of times and turned around and come out, usually in rain."

"You couldn't see the rain before getting into it?"

"Yes, but we went into it to see how bad it was."

"What do you feel in your mind was the prime cause of this accident?"

"Poor judgment, in that I was in the left seat."

"Do you believe your eagerness to complete the mission may have had some influence on your actions, which could have caused you to overlook certain flight planning factors, such as weather?"

"No, because I wasn't really eager to go flying. . . . I was overconfident. Always before, the fog lifted after we got away from the local area."

The pilot and gunner were killed in the crash and subsequent fire. The aircraft commander escaped with a superficial laceration on his right cheek caused by his microphone boom. The fractured boom lacerated his right cheek, apparently when his helmet failed and was torn from his head. The crewchief sustained second degree burns on his legs, arms, and face.

Flight surgeon: "Despite the weather, the aircraft commander chose to ride in the left seat. After takeoff, when it became apparent to him that it was necessary to switch to instruments, he continued to pilot the aircraft due to difficulties in trai rring control during the takeoff phase. As a result, he attempted to watch the instruments on both sides of the aircraft, actually being primarily concerned with the attitude indicator on the right side since he had failed to set his own prior to takeoff. During this process, he neglected both the altimeter and the vertical speed indicator. This resulted in a descending right bank rather than the climbing right bank in which he felt himself to be. . . . The aircraft flew into the ground, skidded approximately 225 meters, rolled on its right side, and burned. . . .

"Contributing causes fall neatly into two intersecting chains. The first begins with the fact that the possession of a tactical instrument certificate caused the aircraft commander to have a great deal of overconfidence in his abilities as an instrument pilot. . . . This overconfidence was compounded by the fact that he failed to check the current and forecast weather, although such service was available to him at the nearest telephone. . . . The other chain begins with the tactical situation of the unit and the subsequent lack of supervision and control of detached personnel. This lack of supervision is shown in the facts that the aircraft commander had not had even a routine checkride in the past 120 days, although command regulations require one at least quarterly, and that he has had no instrument or night flying checks since leaving flight school. He had not flown even a VFR night flight in the past four months. This resulted in a definite lack of proficiency. . . .

"Recommend the provisions of the command regulation requiring aviation personnel to wear gloves and fatigue jacket sleeves rolled down in flight be more strictly enforced. Fifty percent of the burns sustained by the crewchief could have been avoided or considerably mitigated had the provisions of this regulation been followed.

"Recommend continuing emphasis be placed on the shortcomings of the chin and nape straps of the APH-5 helmet. It is the opinion of this investigator that the pilot's unconscious condition immediately following the crash was due to a blow on the head sustained after the loss of his helmet. Had he been conscious at this point, although injured, he might have been able to escape from the aircraft. . . ."

FERRY FLIGHT

LETTER OF INSTRUCTIONS to ferry pilots: ". . . Flights will travel during daylight hours under VFR conditions."

A flight of eight UH-1s departed its station at noon, after a three-hour delay because of various difficulties. The flight, made up of two elements of four helicopters each, made two en route refueling stops, then headed toward its RON destination. At the second refueling stop, the second element departed 5-10 minutes behind the first due to a delay in refueling. En route weather forecasted was VFR with scattered thundershowers.

Pilot of number 7 helicopter (UH-1D): ". . . When we stopped at our second en route refueling point, I saw the flight commander was upstairs getting a weather briefing and I went downstairs and made a phone call. I was on the horn for about 20 minutes and I went out and the first element was already cranking and they were not quite finished refueling our element. I went out and they mentioned something about rain. I guess this was why we were trying to get out and to our RON destination before the front came in. . . . I was flying number 3 slot in the second element. Most of the day, we had been flying something like a diamond, usually not getting any closer than 15 rotor discs. . . .

"I noticed the lead element was stringing way out and we were sitting back there in our group of four where you could barely see the lead ship. . . . Somehow, on the ground, I had changed frequencies and my FM was on 37.4. I noticed this and got on 37.5 in order to raise our leader. He had FM trouble earlier. . . . We heard him call to move it up a little bit, to give us a better chance of staying together, because they were way out ahead of us and they must have been hitting a little bit of rain.

"The fellow flying number 2 in my element was in a C model and he had not flown any formation to speak of. . . . I was flying closer to the lead ship than he was most of the time.

"We kept going and I was trying to reference myself on the map and had my flashlight hung around my neck on a nylon cord. . . . We saw the other element and they said they were going to UHF frequencies, and I thought they said 322.4, so that's what I changed to. It was supposed to be approach control at our destination, but it wasn't. It was some center frequency and I thought possibly they were talking on UHF and I didn't want to cut in on them. I called for the UHF frequency and nobody answered. I asked what frequency the lead element was on and nobody answered me. Then I saw the other four ships.

"When I first saw them, they were headed north and then we came up behind and started a turn. I could tell our leader was going to join up on their tail. Since I was flying the right side, pretty far back, I wanted to stay away from him when he started his turn. He was cutting into me, so I started cutting in and I got pretty slow on airspeed. Actually, I had to drop down slightly and come on around. This daisy chain formed when I saw they were going north, then swung around to a westerly heading. As they were coming around, everybody was circling back around behind me, and I hadn't got around fast enough, so I went underneath my lead ship and got pretty low. . . . I pulled back up and got on his left side because the other two ships were already in trail behind him.

"I looked up and I could see what looked like a pretty nice hole through the rainshowers. About that time, the number 4 pilot in our element asked the number 2 pilot where he was. As I remember,

FERRY FLIGHT

I mentioned to the number 2 pilot that I was going to jump in his slot and would be the sixth ship going through because there would be a big gap between number 5 and number 7 and I was sitting out on the left side. . . .

"I checked one more time and when I looked back up, I only saw one light. There were supposed to be four ships in front of me. I saw the one light and about that time, I hit rain and had the tremendous sensation of being pushed up. I could see a cloud and I thought I was going to be pushed up into it. About that time, I saw this light again and said to myself, 'Stay on the light! Stay on the light!' The only thing I could figure was that it was a ground light because I was bearing down on it pretty fast. I had the collective on the bottom and was trying to keep from running over the light. As near as I can tell, I was in a flare, slowing up to keep from hitting it.

"About that time, I heard the tail rotor and my reaction was to pull. I got a little bit back up in the air it seemed like, and I went on and looked out and had this sensation that I was turning to the right. I said, 'I've lost my tail rotor. . . .' I just pushed it right on to the bottom and she went in. I knew I was turning to the right and seemed to be drifting to the right also. When it hit, the ship rolled real hard. . . . I don't know how far it rolled, but I knew I was partially upside down. I reached down, unhooked my snap, and I was on the ground. . . .

"When I was getting out, I remember hearing another ship. I thought either he saw me go in or he's looking for me, or the guy in the daisy chain behind me was going to come right in on top of me. He was following my lights and I was afraid he was going to end up just like I did. . . . But he went on by and I got over this fence, started around the house to the left side, and finally found the door. I told them I had just crashed a helicopter and asked them to help me. I got in, unzipped my flight suit, and lay down flat on the floor. They called the police right away. . . ."

The pilot sustained a fractured vertebra and the aircraft was a total loss.

Number 2 pilot, second element: ". . . we joined up and took up a 280° heading. . . . In the joinup, I ended up high, so I picked up the rear. Number 4 was calling for number 3 at this time and he couldn't hear him. He called him several times and then I answered and advised that I was picking up the rear of the flight. At this time we started in toward the airfield and picked up a little more separation. Then it started to rain and we got into weather and downdrafts, and the next thing I knew, I had trees and street lights in front of me. I did a cyclic climb and pulled power. . . . When we broke out, I picked up a man on my right and I did not count how many aircraft we had. I started calling number 3 at that time and called the tower and asked how many aircraft we had, since I was the last aircraft. I was on short final when the tower answered and said we had seven. When we sat down, I started calling number 3."

"How low do you think you got?"

"I would say I was down within 75-100 feet of the ground. I don't know how high those trees were but they were above me when I saw them."

Investigation narrative: "Upon arrival in the destination area, the first element was advised that the airfield was IFR and to contact approach control for tower clearance. Approach control advised the flight commander to turn to a 360° heading for a radar vector because of weather between his flight and the field.

"The flight commander advised approach control that he was returning to his point of departure if any delay was expected. Approach control stated he could get the flight to the airfield in about 10 minutes.

"The second element leader contacted approach control and asked if his flight was on radar. Approach control had radar contact 10 miles east of the airfield and vectored the second element to a heading of 180°.

"Approach control vectored the flight commander to a heading of 090° and advised that weather was moving rapidly to the east. The flight commander once again stated that he was returning to his point of departure eastbound. Approach control asked if the second element was returning with the flight commander or remaining until the weather improved. The leader of the second element advised that he would join up and follow the other element back to the point of departure.

"The flight commander next asked approach control if there would be any delay in getting in. Approach control advised there would not be, but some precipitation was between the flight and the field, and advised he would be unable to track the flight on radar, but they might be able to get underneath it. Approach control then called the flight commander and the leader of the second element and said he could turn the flight toward the field. The flight commander asked approach control to turn them toward the field and stated that he would follow the second element.

Disoriented ferry pilot flew toward ground light and crashed into trees

"Approach control then vectored the entire flight in a right turn to a heading of 280°. Three minutes later, the flight commander advised approach control that he was in a heavy rainshower and proceeding inbound to the airfield. After landing, the tower advised the flight commander that seven aircraft had landed. . . .

"The wreckage of the UH-1D was scattered over an area approximately 150 feet in diameter. Indications at the scene were that the aircraft hit the trees on a heading of approximately 050°. The tail rotor separated at the point of initial contact with the trees and the aircraft continued in a very tight, descending right turn. Additional tree strikes indicated the aircraft was in a steep angle of descent. It struck the ground in a right side low attitude and rolled over on the right side. . . .

"The board examined DD Forms 175 and 175-1 and it was determined that the flight plan was not filed in accordance with existing regulations. The remarks section of DD-175 failed to show a complete listing of all aircraft by serial number. It was determined from the witnesses' statements that a complete weather briefing was not conducted by the flight commander, as required by AR 95-2.

"After reviewing the pilot's statement, it was determined that he was having difficulty prior to entering the heavy rainshower. He stated that he had a sensation of being pushed up into the clouds, lowered the collective pitch, and then realized he was extremely low and started a climb. He further stated that he did not reset his altimeter after leaving the second refueling point. Weather records showed the pressure was falling rapidly in the destination area. Terrain elevation at the crash site was 250 feet and the trees were approximately 60 feet tall. The aircraft's altimeter setting was 29.97 and the actual pressure reading was 29.81 at the time of the accident. Since the pilot had not reset his altimeter, it was indicating 160 feet higher than his actual altitude. The total of terrain elevation, height of trees, and altimeter error was 470 feet. The statement of the flight commander that he descended to 500 feet (indicated) to penetrate the heavy rainshower placed his and the aircraft following in proximity to the trees. . . .

"The pilot's statement indicated that although he was instrument rated in fixed wing aircraft, he was not familiar with UH-1 instrumentation. He stated that he never entertained the idea of going on instruments, but planned to remain in visual contact with the other aircraft. He further stated that he had only made four or five GCAs, without

a hood, in helicopters. His flight records showed 1,015.8 total hours, of which 167.8 were rotary wing. He had flown 6.7 hours hood time in the past six months, all in fixed wing aircraft, and no night time had been flown in the last 30 days prior to the accident. . . .

"The statement of the second element leader established that he was experiencing FM radio difficulty prior to leaving the second refueling point. The board questioned him about why he did not request radio maintenance or change aircraft. He replied that he did not feel it was necessary due to the fact that he had UHF contact. The board then determined that positive control of all aircraft did not exist while in formation, which resulted in confusion of the flight. . . .

". . . the flight commander had special fixed wing and standard rotary wing instrument ratings. Two other pilots in the flight had tactical instrument ratings and the remaining pilots had standard fixed wing instrument ratings.

"The DD 175-1 forecasted possible thunderstorms in the destination area at the proposed arrival time. Upon arrival in the destination area, the flight commander received advisories on existing weather at the airfield. The board determined that the flight commander elected to take his flight into these conditions and, therefore, as defined by AR 95-5, weather was not considered a cause factor.

"*Analysis:* The entire flight was in violation of the letter of instructions covering ferry flights, specifically paragraph 2 which states: 'Flights will travel during daylight hours under VFR conditions.' Official sunset at the destination area on the day of the accident was 1712. The lead element of the flight departed the second refueling point at 1655 and the second element departed 5-10 minutes later. The flight plan estimated 45 minutes en route, which would have the first element arriving at 1740, or 28 minutes after official sunset. The second element arrived after this.

"The pilot became disoriented, followed what he presumed to be an aircraft light in front of him, and flew into trees.

"The second element leader had FM radio trouble prior to departure from the second refueling point. No commands were given by either element leader to change frequencies. It was assumed by them that frequency changes would be made without commands. The pilot of the aircraft involved in the accident did not have proper communications during the critical period of time. His UHF radio was set to 322.4 and should have been on 322.5.

"Confusion existed in the second element about each aircraft's proper position in formation. The pilot flying number 2 position broke formation and trailed the flight into the airfield.

"The pilot failed to reset his altimeter after departing the second refueling point. Terrain elevation, the height of trees, coupled with the error in the altimeter setting, placed the aircraft in proximity to the trees.

"Based on the statements obtained, it was determined that two and possibly three other aircraft encountered conditions which could have resulted in loss of life and aircraft.

"The board also determined that violations of command regulations occurred during this flight. These regulations state:

" 'Brief each pilot on the weather, flight plan, and other pertinent information.'

" 'Certify in the remarks section of DD Form 175 or FAA Form AGA-398 that the above items have been accomplished.'

" '. . . each crewmember has been briefed on the weather, missions, and other pertinent information regarding the flight.'

" 'Positive voice communication exists between all aircraft of the mission.'

" '. . . each aviator understands and is proficient in the procedures for changing or breaking formation.'

"*Established cause factors:* Supervisory error on the part of the flight commander, in that he elected to fly after darkness in other than VFR conditions in direct violation of paragraph 2 of the letter of instructions for ferry flights.

"The flight commander exercised poor judgment by leading a flight of eight aircraft into IFR conditions when he, in fact, was the only pilot who possessed a rotary wing standard instrument rating.

"The pilot lost spatial orientation due to restricted visibility and turbulence. This resulted in his following what he assumed to be the light of another aircraft to his front. Actually, it was a light on the ground.

"*Probable or suspected cause factors:* The flight commander exercised poor judgment by attempting to meet a prearranged schedule for the day's flight, after having been delayed approximately three hours from his scheduled takeoff time.

"A lack of positive control of aircraft in the flight. No commands were issued by the flight leaders to switch frequencies. It was assumed by the flight leader that this was done. The FM radio of the second element leader was inoperative."

GO-NO-GO

"This is an outstanding accident report. The board is commended for its thorough and factual appraisal . . ."

INVESTIGATION NARRATIVE: "The UH-1D lifted to a hover and departed to the west. Traffic at the airfield was very heavy and the pilot had to alter his takeoff course to avoid a twin engine airplane which was holding at the intersection for takeoff. The helicopter's takeoff rpm was approximately 6650, with an egt of 600° C, and a torque of 37 psi. The percent gas producer rpm (N_1) was unknown.

"During takeoff, the low rpm audio warning sounded. As the helicopter proceeded to a position abreast of the twin engine airplane, the aircraft commander noticed that the rpm had decayed to 6100 and that the pilot was attempting to regain rpm by reducing collective pitch. Descent was not possible at that time because of the waiting airplane, a refueling pit, radio antennas, and other parked aircraft.

"When the rpm had decreased to 5800, the aircraft commander took control. He attempted to regain rpm by reducing collective and losing altitude, but was unsuccessful. He realized a crash was imminent and warned the pilot as they approached a large tree. The aircraft commander flared to reduce forward speed and applied remaining pitch to cushion the impact just before the aircraft hit a tree, then the upper part of a large building, then the ground, and finally a small building. It came to rest inverted against the small building and burned. Only four occupants survived the accident, the aircraft commander, the pilot, and two passengers. These four sustained critical injuries and the pilot and one passenger later died."

Though the aircraft commander and pilot were wearing gloves, both had their sleeves rolled up and sustained burn injuries to their arms.

"Analysis: The collection and assembly of data pertaining to this accident was complicated by the almost total destruction of the aircraft in the crash and subsequent fire; by the board's inability to interview the surviving aircraft commander and pilot prior to their evacuation; and by the environment at the time, which made it extremely difficult to isolate specific information regarding the aircraft and its performance from the takeoff point until it disappeared from observation. To ensure that all possible cause factors were explored, the board considered three areas, separately and collectively. These were:

"1. The aircraft.

"2. The aviators.

"3. The environment, including the weather, the airfield, and operational pressures.

"The questions to be answered were:

"1. Did the machine fail? If so, what system and why?

"2. Did the men fail? If so, was the failure attributed to technique, judgment, or an act of omission? The board fully recognized the danger of second guessing people who were confronted with an emergency situation.

"3. Did both machine and men contribute to the accident? If so, to what degree?

"All members were encouraged to be objective, critical, and curious.

"The aircraft: Among factors revealed by inspection of the aircraft historical records were:

"1. A hot start had occurred two months before

and a hot end change accomplished.

"2. A new fuel filter was installed seven days prior to the accident.

"3. The fuel filter warning light had been written up as inoperative five months before and carried forward until 18 days before the accident when it was written off as 'checked and found O.K.'

"4. There was no record indicating updating of the GO-NO-GO placard as required by a command regulation. There was also no record of a vibration check, engine trim check, or power check having been made.

"5. The manhours recorded on the last two PEs (70 hours each) appeared to indicate that the mechanics were under pressure to expedite the inspections.

"6. Intermediate inspection number 2 was completed the day before the accident. All screens had been checked and no engine or control deficiencies noted.

". . . Conversations with flight line maintenance personnel tended to indicate that the aircraft had a reputation of 'not being the most powerful ship in the fleet.' . . . Analysis of the engine and other recovered parts indicated there had been no engine mechanical failure. The engine was not developing power at impact, but was turning free. The main rotor blades were not broken upon contact with the tree or building, but were swept back. This indicated low rotor rpm at the time of the tree strike. This is further evidenced by the aircraft commander's comment that he pulled everything he had (collective pitch) in an effort to cushion the crash.

"The aviators: The aircraft commander and the pilot had often flown together on operational missions. Both had a reputation for being intensely loyal to the division and dedicated to getting the job done. There were no records available to indicate that either aviator had received a standardization ride within the preceding 90 days.

"Both aviators had experience in the area and had previously flown heavily loaded helicopters. Although the aircraft commander, at the time of takeoff, noted 37 psi, 600° egt, and approximately 6650 rpm, the percent gas producer rpm (N_1) was not noted. Significantly, his statement indicated that he thought there were six passengers and three PRC-25 radios aboard. In fact, there were seven combat loaded passengers, with four PRC-25 radios. It is not known if the pilot was aware of the load.

"The environment: Elements of ground forces in the area were involved in a major operation. Air traffic, both fixed and rotary wing, on and around the airfield, was extremely dense. Except for the active runway, the airfield was cluttered with supplies, vehicles, refueling facilities, aircraft, and people. At the time of takeoff, even the active runway was blocked by a holding twin engine airplane. This required the helicopter to maneuver to the left, at the same time putting its flight path over other obstacles off the runway.

"The weather at another airfield approximately 30 kilometers to the west was: estimated 10,000 feet broken, visibility 10 miles, sea level pressure 1011.1 millibars, temperature 84°, wind 020° at one knot, altimeter setting 29.86, density altitude 2,300 feet, and pressure altitude +85 feet. Although a weather observation was not taken at the airfield where the crash occurred, it is reasonable to assume that similar conditions prevailed.

"It could not be determined what the power settings were for the holding twin engine airplane. However, it is safe to assume that, even at idle, there was some downwind effect transmitted to the air through which the helicopter passed as its rpm was deteriorating.

"There was a general sense of operational urgency prevailing at the airfield on the day of the accident. The personnel loaded on board were moving out to a forward assault area. In addition to the recognized pressures of wanting to get on with the job at hand, the aircraft commander also felt a need to clear the active runway. This is evidenced not only by the twin engine, fixed wing airplane holding at the intersection for takeoff, 180° to the helicopter's takeoff direction, but an O-1 pilot had called for clearance to land on the same runway in the direction of takeoff.

"Considering these factors, the board then attempted to reconstruct the sequence of events in order to determine what caused the aircraft to stop flying. It would appear that, with the loading of the helicopter which was sitting in the middle of the active runway, events began to occur which prevented the successful accomplishment of the flight. At this point, apparently unrecognized by the aviators, seven combat loaded soldiers and four PRC-25 radios were loaded, rather than the six soldiers and three radios acknowledged by the aircraft commander.

"Using 240 pounds for each of the 11 persons aboard (this accounts for field gear, rations, water, and other equipment), 1,200 pounds of fuel, other known pieces of fixed equipment, and the basic weight of the helicopter, the estimated gross weight at takeoff was computed to be 9,385.4 pounds.

"Using the various power charts available in the −10, and assuming a normally functioning engine developing rated horsepower, it was feasible for the aircraft to have hovered, taken off, and cleared the obstacles along the flight path. It is a fact that the aircraft did take off and clear the obstacles on the field, but did not sustain flight.

"Generally speaking, seven soldiers with equipment is not an unusual load. However, with this load, something less than 1,200 pounds of fuel is desirable. Additionally, the factor of an engine having the reputation of 'not being the most powerful in the fleet,' must be added. In any event, with the load aboard, the task was further complicated when a positive check of the GO-NO-GO placard was not made prior to takeoff. While this information might not have been too valuable because the engine historical records did not indicate any valid power data, the reading from a reliable gas producer tachometer is the best indication of power being produced and power available. The power system—not properly checked—was now required to lift a load—not properly accounted for—into a slight downwind condition at a density altitude of 2,300 feet. Witnesses stated that the aircraft turned slightly to the left to avoid the the airplane waiting for takeoff. This created a drag on available power. There was also an indication that the aircraft made an airspeed over altitude takeoff which requires even more power.

"When the helicopter was opposite the airplane at the intersection, it appeared that takeoff had been accomplished and flight assured. At this same time, the aircraft commander noted that the rpm had decreased to approximately 6100 and that the pilot was attempting to regain rpm by reduction of collective pitch. It would not be too alarming for the rpm to drop to 6100, providing the opportunity to take corrective action was present. A reduction of collective pitch, coupled with a slight flare, will increase rpm. In this case, based on the comments of witnesses, the aircraft appeared to remain level. These statements and the aircraft commander's comment that the pilot only reduced collective indicated that a positive flare was not initiated. Since the aircraft did not appear to lose altitude, this would indicate that, if collective was lowered, some aft cyclic was applied. Concern was expressed for the obstacles along the runway, so the aircraft was required to maintain altitude.

"That additional power demands were being placed on the system was evidenced by statements indicating coning of the main rotor. The fact that additional power was not available was indicated by a continuing decay of rpm as seen on the instrument panel by the aircraft commander, and by statements from witnesses that the blades appeared to be slowing down.

"At approximately the end of the airstrip, the aircraft commander assumed control and attempted unsuccessfully to regain rpm by reduction of collective pitch and loss of altitude. There was no evidence of a flare until just prior to the tree strike. When the helicopter hit the tree and the aircraft commander applied the remaining pitch, further flight was not possible. . . .

"In the discussion to this point, it would appear that the aviators made errors in judgment and technique which directly contributed to the accident. However, the possibility of engine failure, complete or partial, after takeoff and along the flight path had to be examined. There was no constructive evidence to validate this thought. Analysis of the instrument panel showed an indication of 36 psi fuel pressure at the time of impact. Furthermore, the aircraft commander's comment that there was no apparent difficulty with any system, including the engine, had to be considered. On the other hand, the results of the engine analysis established that, while there had been no apparent mechanical malfunction, the engine was not delivering power at the time of impact, but was turning freely. Using the aircraft commander's comment that he had approximately 5500 rpm just prior to or at the tree strike, the board judged that the impact referred to in the engine analysis was at the time when the aircraft struck and came to final rest against the corner of the smaller building. By that time, sufficient damage may have been done to have caused a loss of power.

"It was not possible to conclude that a total power failure had or had not occurred in flight. A partial failure remains a possibility. Because of destruction by fire, further investigation of this possibility could not be accomplished.

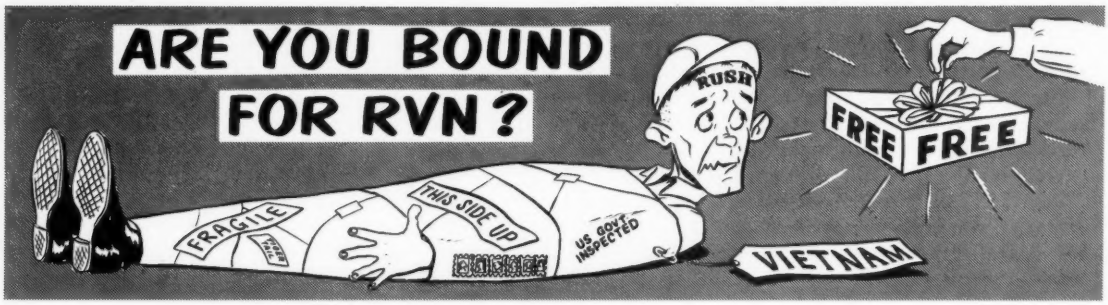
"Cause factors: The aircraft commander did not verify the load he allowed to be placed aboard the aircraft.

"The aircraft commander did not initiate prompt and proper corrective action to recover from a low and deteriorating rpm condition.

"The aircraft commander did not complete a GO-NO-GO check prior to attempting takeoff.

"Required power checks were not accomplished and appropriate engine data was not recorded in the aircraft maintenance records."

Army command endorsement: "This is an outstanding accident report. The board is commended for its thorough and factual appraisal of this accident."



IF YOU HAVE been alerted for assignment to the Republic of Vietnam, you should get the new aviation packet described below.

By 1 November 1967, USCONARC schools will have developed pre-Vietnam orientation packets which reflect the latest doctrine and techniques relating to specific duty assignments of officers and NCOs in RVN.

The aviation packet is designed around three aviation MOS groups: type A for aviators and NCOs, type M for maintenance personnel, and type O for flight operations specialists.

The type A packet is for all aviators and E-9, -8, -7 and -6 enlisted aviation personnel. Each packet will include:

1. The booklet Common Subjects and Reference Data for Army Aviation in the Field Army, which is updated annually.
2. A tactics booklet of selected items, such as target engagement techniques.
3. A flight operations booklet containing data on airfields in RVN, a map of the Decca chain in RVN, and similar materials.
4. A maintenance booklet consisting of information on aircraft forms and records, troubleshooting and maintenance techniques peculiar to RVN, and other maintenance matters.
5. A numbered newsletter of recent RVN developments, especially oriented to the packet areas of interest.

The type M packet is for EM with maintenance MOS. It will include items 4 and 5 only.

The type O packet is for EM with flight operations and air traffic control operations MOS. It will include items 3 and 5 only.

Before deciding whether you need to submit the order blank at the bottom of the page for your copy of the packet, answer these questions:

• *Have I received orders to take a USAAVNS course en route to RVN?* If you have, don't use the blank. You will get your copy of the packet while in school.

• *Am I commanding an aviation unit? Am I to go to RVN as a member of an aviation unit?* If you command the unit, write a letter to USAAVNS requesting the number of each type packets (A, M, and O) required by your unit. If you are a member of the unit, you'll get your copy from your CO.

If you can't expect to get your copy of the packet through these means, fill out the order blank and mail it. Be sure to notice that the type A packet includes material in the other two (M and O).

TO: COMMANDANT
US ARMY AVIATION SCHOOL
ATTN: AASPI
FORT RUCKER, ALABAMA 36360

REQUEST ONE COPY OF THE AVIATION RVN ORIENTATION PACKET (TYPE SHOWN BELOW) BE SENT TO THE ADDRESS BELOW, WHERE I EXPECT TO BE UNTIL _____ (DATE).

GRADE _____ FULL NAME (PRINT) _____

MAILING ADDRESS _____ ZIP CODE

CHECK TYPE PACKET DESIRED: ☐ TYPE A: AVIATOR OR E9, 8, 7 OR 6.

☐ TYPE M: EM MAINTENANCE MOS's, FOR ☐ 67 A THRU Z OR ☐ 68 A THRU Z.

☐ TYPE O: EM FLIGHT OR ATC OPERATIONS MOS's, FOR ☐ 93B OR ☐ 93D OR ☐ 71P.

SIGNATURE _____

ASSIGNMENT _____
(IF NOT IN ABOVE ADDRESS)

U-21s TO VIETNAM

THE ARMY'S U-21A is in Vietnam. A number of the aircraft, capable of carrying up to 10 combat-ready troops, arrived at a United States airfield in South Vietnam last month.

An 18-man team of Army instructors has been training Army aviators and mechanics since the first of the month. They are assisted by specialists from Beech Aircraft Corporation, manufacturer of the U-21.

The planes were flown to Sharp Army Depot at Lathrop, Calif., for processing before being hoisted aboard an aircraft carrier at the Alameda Naval Air Station for the trip to Vietnam. The aircraft are part of a contract for 129 U-21As.

Beech training specialists, skilled in the instruction of the U-21A's complete systems from propellers to avionics, will be responsible for ground instruction for pilots and maintenance instruction for mechanics.

Military instructors, headed by an Army major, underwent extensive training at the Beech factory. Five pilot instructors received a week of ground school on aircraft systems and 25 hours of flight instruction. Twelve enlisted men received a two-week course in maintenance.

Powered by a pair of Pratt & Whitney PT6-A 20 engines identical to the pressurized King Air powerplants, the aircraft is quickly converted into an air-evacuation ambulance, transporting three litter patients and three ambulatory patients at speeds of more than 200 mph.

In other configurations, the U-21A can carry a two-man crew and from six to eight persons in a 300-mile radius of action. A giant cargo door, forward of the regular airstair cabin door on the King Air, provides overall cargo accommodations of 53½ by 51½ inches. (See DIGEST, July 67.)

WITCHERY OR INGENUITY?

See PEARL . . . pages 51-53